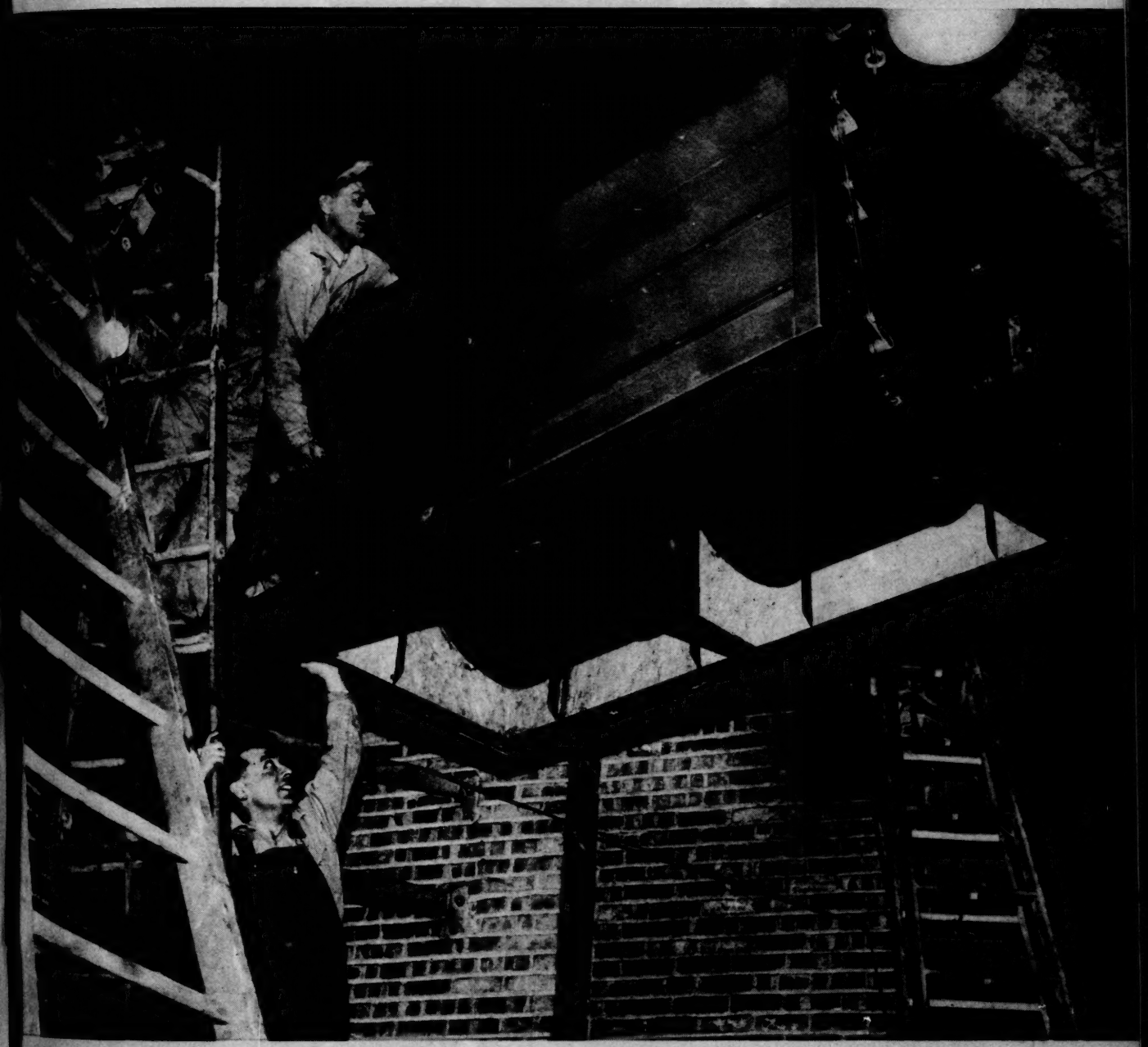
JULY, 1952

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION



For cool heads at political conventions, Chicago's International Amphitheater gets 1,000 tons of air conditioning. See page 3.

rformance of a Heat
p Water Heater . Page 63

Computing Hot Water Demand . . . Page 70

Humidity Control in Jet Plane Cabins . Page 75

What You Can Do About Water Hammer . Page 83

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ADJUSTABLE PIPE HANGERS AND SUPPORTS

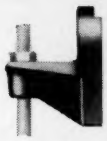
for every piping requirement • • •

BRACKETS, HOOKS, CLAMPS for attachment to walls, columns and beams

Light Welded Steel Bracket
fig. 194
max. load: 750 lb.

Medium Welded Steel Bracket
fig. 195, max. load: 1500 lb.
heavy welded steel bracket
fig. 199, max. load: 3000 lb.

Side Beam Bracket
fig. 202
load: 150 to 2300 lb.



Side Column Bracket
fig. 203
load: 150 to 390 lb.

Cast Iron Bracket
fig. 223
load: 610 lb.

Cantilever Bracket
fig. 221
with angle iron ext.
fig. 222

Single Hook
fig. 168
½ to 3 IPS

One Hole Clamp
fig. 126
⅜ to 4 IPS

FLANGES, CLIPS, HOOKS for attachment to the ceiling

Adj. Swinging Hanger Flange
fig. 155, for ⅜ to ⅞ in. rod
flange only
fig. 156, for ¾ to 12 in. pipe

Swivel Hanger Flange
fig. 154
for ⅜ to ⅞ in. rod

Pipe Hanger Flange
fig. 153
for ⅜ to ⅞ in. rod

Ceiling Flange
fig. 128
for ⅛ to ¾ IPS

Adj. Clip Base
fig. 116
for ¾ to 2 in. pipe
⅜ in. rod size

Wrought Clip, Long
fig. 263
short: fig. 262
½ to 4 in. pipe

Tin Clip
fig. 231
¼ to 2 in.

U Hook
fig. 205
¾ to 8 in. pipe

Call Your Local Grinnell Distributor or write for Hanger Catalog.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

HOT JOBS call for COOL HELP!

Pouring liquid steel into ingot moulds at a temperature of 2800° F. is a hot job that demands skill and constant attention. When workmen are exposed to such intense heat, thermotic fatigue can be a real problem.

At Colorado Fuel and Iron Corporation's mill in Pueblo, Colorado, they solved the problem by mounting a DeBothezat "Hy-V" Air Jet on the cab of the crane which handles the ladle, so that the fan unit travels right with the men as they work. "Hy-V" Air Jets project a concentrated stream of fresh air as far as 35 feet, without the use of ducts, to keep workers comfortably cool, alert and efficient.

DeBOTHEZAT "HY-V" AIR JET is a 14-blade axial-flow pressure fan in a nozzle-shaped housing. It can be furnished with a bracket for wall installation or it can be mounted on a portable wheeled stand. Both types are available with fan wheels from 18" to 30" in diameter, with capacities up to 12,000 CFM.

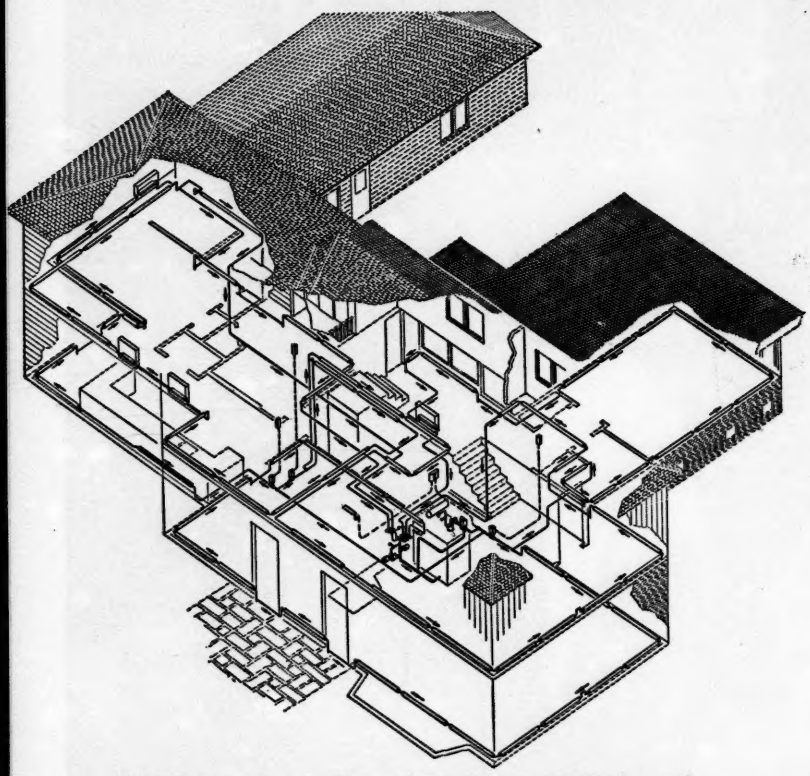
Ask your DeBothezat Fans representative or write the factory today for a bulletin on "Hy-V" Air Jets. Address Dept. HV752.

Certified Ratings

DeBothezat Fans

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

"...like a balmy night in June regardless of outdoor weather"



Heating plan for the Hinman home. Webster CF-2 Unit provides master control. Duplex clock thermostats provide overheat limit control for each of three zones, as follows: (1) Living room and dining room. Also includes one bedroom and bath. (2) Kitchen wing and servants' rooms. (3) Bedrooms on the second floor. Heating installation made by Seaman & Muller, Port Washington, Long Island.

Installation with Tru-Perimeter Forced Hot Water Baseboard Heating . . . 5 Circuits . . . 3 Zones . . . Outdoor Thermostat Control

A cold wind whistling in off Long Island Sound with gusts up to 60 miles an hour . . . and yet the Hinman home is warm and comfortable. George R. Hinman, president of Pioneer Scientific Corp., says:

"In 1950 when my Architect, Julius Gregory, showed me the sketches for our new house, I was struck by the large amount of glass. This and the exposed location made me think of Webster Baseboard Heating.

"Now we have been through two complete heating seasons. Temperatures everywhere in the house are like a balmy night in June, regardless of outdoor weather."

For a heating system that will match the truly fine home, consider Webster Tru-Perimeter Heating. Your Webster Representative will give you full details. Or write us.

Address Dept. HV-7

WARREN WEBSTER & COMPANY
Camden 5, N.J. Representatives in Principal U.S. Cities
In Canada, Darling Brothers, Limited, Montreal

Webster
TRU-PERIMETER FORCED HOT WATER BASEBOARD HEATING

The master bedroom with glass on three sides is comfortable at all times – with mild heat in mild weather, full heat when the outdoor temperature falls or high winds blow.

The home of George R. Hinman, with its commanding view of Long Island Sound, presented a heating challenge because of its exposed location and wide expanse of glass. Mr. Hinman says: "I asked my architect about Webster Baseboard Heating and we agreed it was the logical solution. How right we were!" Julius Gregory, A.I.A., was the architect. Wesley Copp, of Sands Point, was the builder.

HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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The Industrial Press

Also Publishers of
HEATING & PLUMBING EQUIPMENT NEWS
and technical books.

THIS MONTH'S COVER

Republican and Democratic conventions at the huge International Amphitheater in Chicago will be cooled by four suspended-type air conditioning units like the one shown in process of installation. Units will circulate 210,000 cfm of conditioned air through ducts to provide 1,000 tons of cooling, 5 air changes per hour, for expected 12,000 people. Photo and controls by Minneapolis-Honeywell.

Washington News

LORING F. OVERMAN

AT press time for this column, Congress and the defense agencies were poring over the roadmaps, trying to decide whether to turn right or left; whether to go over the hill, or tunnel under it.

Only one thing was crystal clear. American citizens were not too well satisfied with progress made toward the goal of national defense during the two years since K-day. Two years! During that period in World War II, the country was well on its way to victory.

What has happened during the 23 months since Korea? To the families of the 100,000 wounded or killed on that bleak peninsula, it must seem that virtually nothing has been accomplished. We are told that the Russians are far outdistancing us in plane production; that we do not even get into production on new planes and weapons before somebody changes the designs and we start over again.

But despite the delays, the indecision, the strikes and the politics, there is evidence that the sleeping giant of American productivity has been awakened; that at last is ready to swing into action.

Growing Strength

Observes the fifth quarterly report of the Director of Defense Mobilization, "Our defense mobilization effort, coupled with the efforts of our allies, has already altered the balance of power of the world."

In support of this viewpoint, the defense agency cites these points:

1. First quarter deliveries of military hard goods—tanks, planes and other weapons—reached $5.1 billion, a gain of 38% over the previous quarter, and almost six times the rate of the first quarter after the invasion of Korea.

2. First quarter deliveries of all types of military goods, plus construction, totaled $6.9 billion.

3. The mobilization program is now two-thirds of the way to the peak rates of production originally scheduled.

4. During the first three months of 1952, jet aircraft production increased by about 33%, and during the 1952 year, that rate of production will be doubled. The production of one critically needed type is scheduled to be increased by 10 times. In March, one company alone turned out more than 400 jet engines.

5. We are now reported to be in the period of peak activity in the expansion of our basic industries. New capacity in steel, aluminum, electric power, petroleum, chemicals and other basic industries are coming into production almost daily.

New Mobilization Pattern

When the military production pattern was first conceived back in 1950, it called for a rapid buildup of weapons production, followed by a sharp decline. That plan was never considered as final, for it was recognized that circumstances might alter the pattern. New decisions have now been made, and the earlier pattern has been discarded. Production, as now scheduled, will continue to rise sharply through 1952. Instead of declining, however, it will level out during 1953 and 1954 on a high plateau.

This plateau pattern, however, contains a variety of individual patterns. Production of the most critically needed items—tanks and planes—will continue to rise through 1952, 1953 and 1954. At the same time, the production of items which can be made in large quantities on short notice will begin to level off almost at once.

As the planners see it, this plateau pattern has several advantages over the peak-and-decline pattern:

1. The stress which the mobilization program places upon the general economy will be distributed over a longer period of time. Thus the plateau pattern appears to assure maintenance of a strong and healthy economy.

2. The plateau pattern permits a high degree of modernization of equipment.

3. It assures high, continuing production levels over a longer period of time, thus keeping intact a trained and ready production organization that can expand quickly if an emergency requires it.

A Look Behind, and Ahead

Unless something unexpected turns up, the road ahead should be somewhat easier. The planning and organizing stage is past, and the method of allocating raw materials through the Controlled Materials Plan seems to be functioning smoothly. Although the CMP system may be modified somewhat to cover only military allocations, Congress has given little indication of wanting to discontinue controls over military production.

The period of severest shortage of basic raw materials also appears to be past. Civilian industries have already been permitted bonus allotments of aluminum and copper —and increased steel allocations await only settlement of the strike and the catch-up period that must follow.

The Long-Range Problem

The possibility that we will have to maintain high-level military strength for an indefinite period will be a new experience to this country. In past periods of national emergency, the country has gone "all out" for military strength—and as soon as the fighting stopped has gone all out for demobilization.

Today's indications are that we must now prepare to spend an unknown number of years on a plateau of high-level strength, in constant readiness to move quickly into full mobilization.

Under such a conception, planners say, new problems remain to be solved:

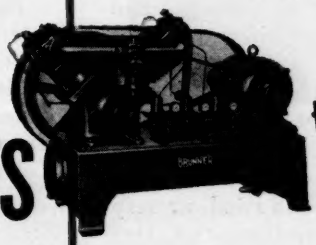
1. Military equipment produced in the next few years must be constantly modernized. Changes in weapons occur so rapidly that even after current goals are attained, we cannot expect to return to the level of military production in effect before Korea.

2. Mobilization facilities must be completed and maintained at a high level. To assure a degree of readiness, we must compute all the requirements of war—including raw materials, plant capacity and machine tools—and be certain that every element of production will be ready if needed.

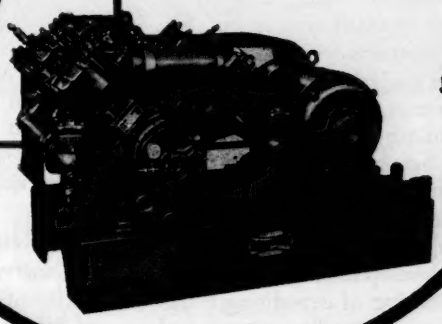
3. A minimum set of controls (the planners say) may

BRUNNER REFRIGERATION CONDENSING UNITS give you all 3!

the performance you depend on



the economy you want



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PERFORMANCE that you get only with units that are soundly engineered, rugged, and precision manufactured. Slow-speed "open type" compressors, extra deep cylinder cooling fins, fan type flywheels, oversize condensers and a score of other Brunner features that reflect constant engineering research and years of proven success.

ECONOMY that is recognized by thousands of users of commercial and industrial refrigeration and air conditioning. Men who watch operating and maintenance costs are Brunner's strongest boosters.

SIZES designed to fulfill your customers' needs from the air conditioning of large buildings, to holding meat at sub-zero temperatures, or keeping beverages cool. Sixty-nine air and water cooled models—¼ hp. to 75 hp.—for single or multiple unit installations.

And a big PLUS... effective field help whenever you want it!

The new illustrated Brunner catalog gives you easy-to-use application data for determining the equipment you need for low cost, high efficiency air conditioning and refrigeration. But that's only part of the story. Why not get details of the Brunner proposition now? Write, wire or phone us today.

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REFRIGERATION AND AIR CONDITIONING

BRUNNER MANUFACTURING CO., UTICA 1, NEW YORK, U. S. A.

BRUNNER SINCE 1906

AIR CONDITIONING
Self Contained Units to 10 hp. For remote installation...Brunner Condensing Units to 75 hp.

REFRIGERATION
Condensing Units from ⅛ hp. to 75 hp. 69 Air and Water Cooled Models.

AIR COMPRESSORS
Single stage ¼ hp. to 2 hp. Two stage 1½ hp. to 15 hp. Horizontal and Vertical Models.

have to remain in effect after the buildup period.

4. Manpower aspects of the mobilization base (the production facilities) must be considered and provided for. The possibility of war requires not only men for military service, but skilled men and women for industrial assignment. It requires a peacetime cataloging of the wartime needs for various categories of scientific, engineering, medical and other skilled and professional personnel, and the steps necessary to assure that the necessary numbers are trained in advance.

5. A civil defense readiness must be developed and maintained. The more time that passes without a major war, the more likely that such a war—if it comes—would begin with a powerful atomic attack. The need for trained civilian defense personnel will increase with the years.

Between Seasons

With the foregoing major problems in mind, we may preview the second half of 1952 with assurance that there are busy days ahead. Deliveries of military equipment are scheduled to climb to about $10 billion a quarter by the end of this year. Of the approximately $94 billion available to date for military expenditures, about $71 billion has been obligated in contracts with industry and orders to government arsenals and shipyards.

As military production mounts, an increasingly important problem will be scheduling—making certain that thousands of individual components arrive at the right place at the right time. Among recent actions to assure component control, the manufacturers of such items have been given a priority rating equal to that of the producer of the end-product. Another development aimed at preventing bottlenecks is the organizing of expediting teams which will visit contractors of specific military items and work toward assuring deliveries on time.

Another factor of importance to business as the defense program goes into high is manpower. Almost six million workers are now employed in defense industries, according to NPA estimates, and an additional two million will be needed. Most of these will be obtained by shifting workers from non-defense activities to military production, in most cases without changing their place of employment. About 800,000 will be new workers, however, many of them in new locations and requiring housing, schools and recreational facilities.

Yes, the nation's growing military program, coupled with related programs supporting transition to armed might, and migration to new fields, will offer much to watch in the months ahead.

Gas Order Studied

Modification or revocation of PAD Order No. 2—the natural gas limitation order—was forecast as the Petroleum Administration for Defense summoned public utility commissioners from 15 States and the District of Columbia to meet June 27 at the Interior building in Washington.

The Order has been in effect since August, 1951, and restricts extension of gas service to both house-heating and industrial consumers. Purpose of the June 27 meeting was to consider how modification of the order might affect existing state-promulgated restrictive orders.

PAD Order No. 2, as originally issued, required that no federal restrictive order on natural gas could apply in any state in which a regulatory body had power to impose its own regulations, and certified to the President that such power was being used to fulfill the purposes of the Defense Production Act of 1950. Several States filed such certification, with the result that PAD Order No. 2 is effective only in Connecticut, Delaware, District of Columbia, Massachusetts, Michigan, New Jersey, New York and Rhode Island.

Oil Shale Retorting Reported

Results of Bureau of Mines experiments with batch retorting of oil shale are reported in a new publication entitled "Pilot-Plant Batch Retorting of Colorado Oil Shale." The report is available without charge from the Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa. Tests were conducted at the Bureau's pilot plant at Rifle, Colorado.

Heating Shipments Static

Four small gains in heating equipment totals for April were offset by two losses, the Census Bureau has reported. Shipping increases were reported for oil burners, up 14% to 45,481 units; floor and wall furnaces, cast-iron boilers and water heaters, up 3% to 27,578 units, 9,480,000 pounds and 176,036 units, respectively.

Warm air furnaces decreased 5% to 50,933 units; cast-iron radiation, 15% to 1,760,000 square feet. Stocks of most types of cooking and heating equipment were above normal inventory levels in March.

Fuels Research Contract

Construction of a new $2.6 million fuels research experiment station at Morgantown, W. Va., for the Bureau of Mines, will be started soon by the Southeastern Construction Company, Charleston, W. Va.

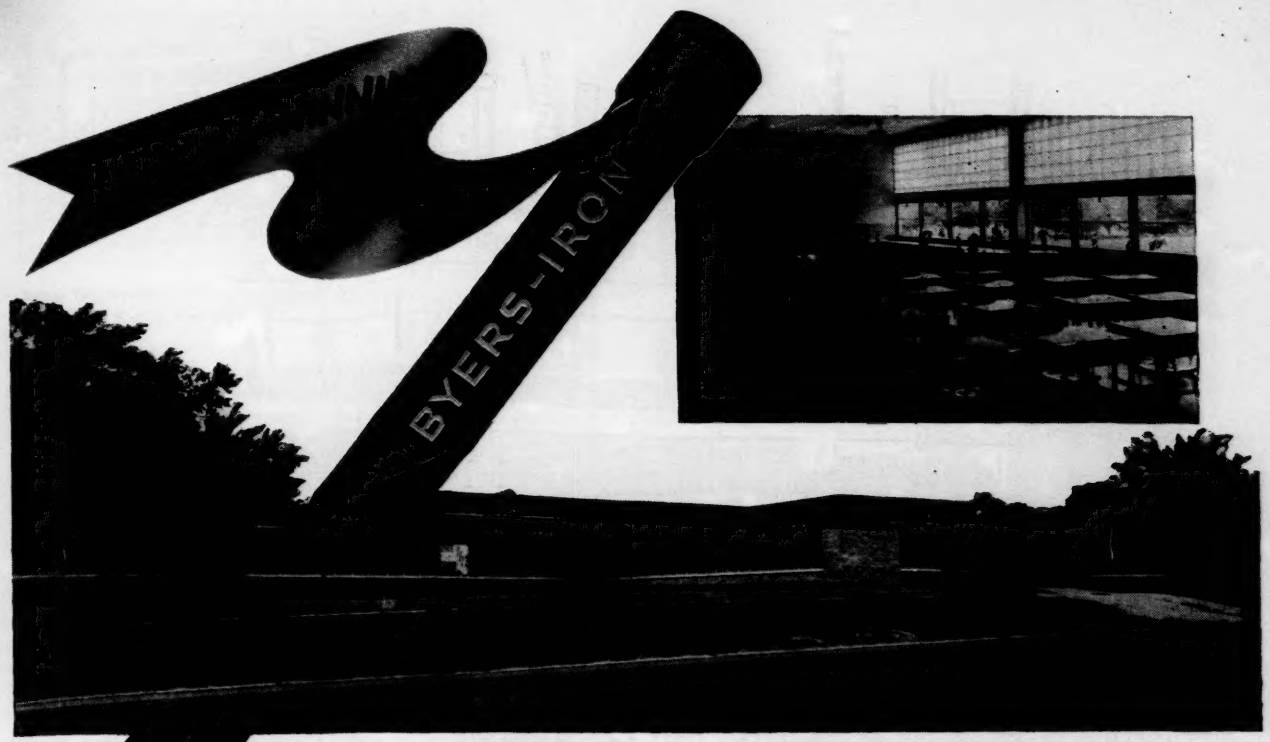
Principal activities of the station will be research on production of synthetic gas from coal. The gas, in turn, will be subjected to experiments directed toward production of liquid fuels, ammonia, alcohol and other chemicals. The station will also conduct mining studies and health and safety work now carried on in rented quarters at Fairmont, W. Va. It will also be the headquarters for petroleum and natural gas research in the Appalachian area.

Stoker Sales Up 9%

The Department of Commerce reports factory sales of mechanical stokers for April at 1,195 units, or 9% above 1,097 in March, but 12% below 1,353 units in April, 1951. Seventy-nine per cent of the stokers were for residential use, small apartments and small commercial heating jobs. Totals for April of this year included: large industrials, 60 units at 40,002 horsepower; small industrials, 76 at 10,526 horsepower; medium commercials, 113 units at 5,086 horsepower.

431 Commercial Projects

Third quarter allotments of controlled materials for 431 commercial projects have been granted by the National Production Authority. Larger classifications included 92 retail stores to cost about $48 million, and 51 office and loft buildings costing $31 million. An additional 500 applications for permission to construct commercial buildings are pending.



BYERS WROUGHT IRON PIPE

safeguards the radiant heating system and 6 other services

Selected by the American Association of School Administrators as one of the best modern rural school designs, the Lincoln Grade and Junior High School, Lincoln, Kansas, represents an outstanding example of functional architecture and material selection.

Arranged to serve community and students with equal comfort and efficiency, the $320,000 structure features a radiant heating system augmented by a duct system that introduces tempered fresh air into the classrooms. In addition to the over-all comfort provided by the system, the lower-aged children playing on the floor are protected from hazardous drafts. To assure permanence and freedom from maintenance, the designers specified genuine wrought iron for the radiant heating coils. This time-tested material was also used for steam and return lines, blow-down and gas lines, vents and downspouts. Shaver and Shaver were the architects; Ryan Engineering Company, the consulting engineers.

Byers Wrought Iron pipe has rolled up impressive service records in all these services. And because it has demonstrated its ability to serve longer, it is the first choice of experienced engineers everywhere.

Our booklet, THE ABC's OF WROUGHT IRON, tells how genuine wrought iron is made, where it is successfully serving, why it lasts longer. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N. Y.

Why Genuine Wrought Iron Lasts

This notch-fracture test specimen illustrates the unique fibrous structure of genuine wrought iron—which is responsible for the high corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective sacle, which shields the underlying metal.

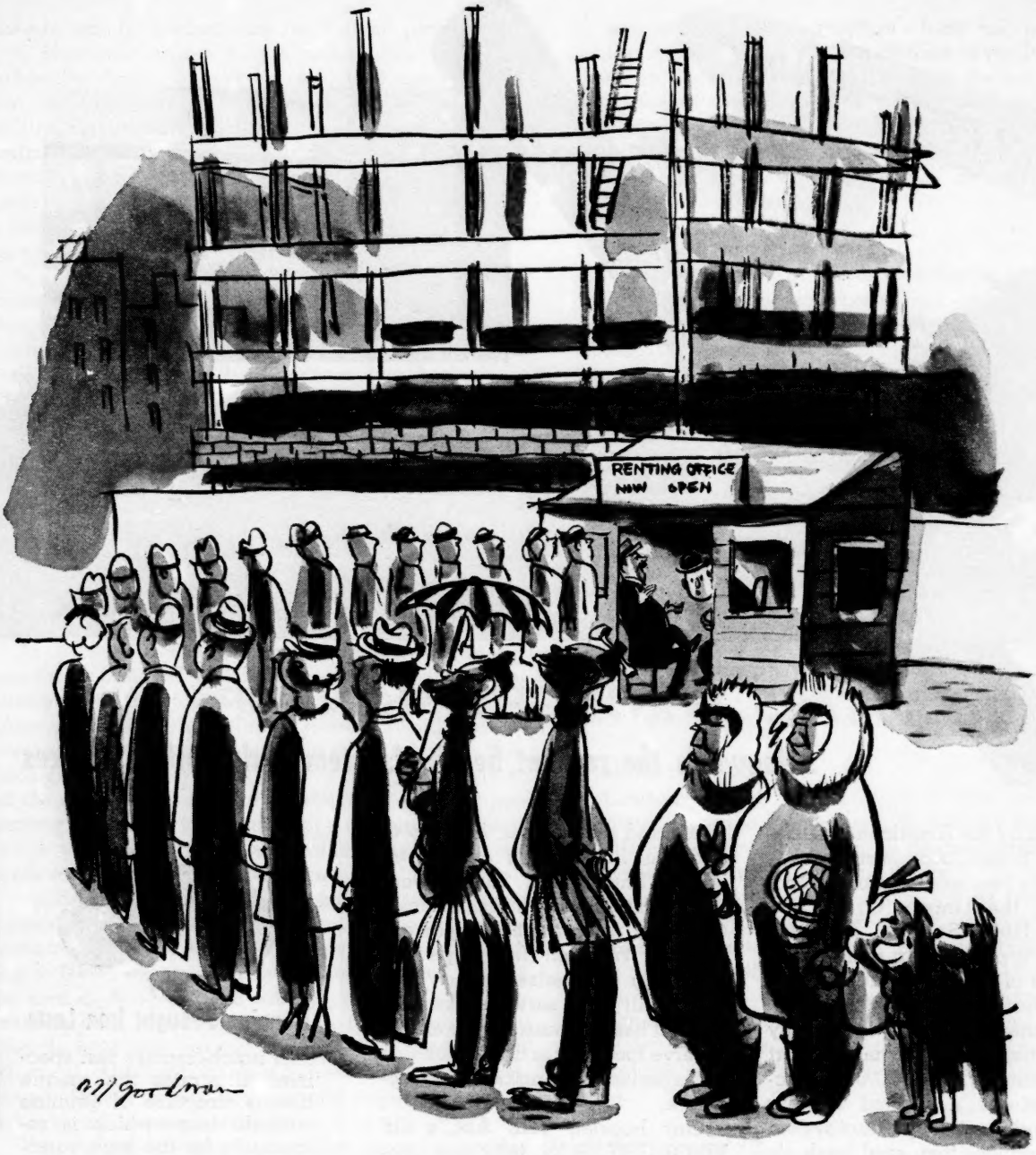
BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS



"Smart engineer! With Honeywell temperature controls everyone will be satisfied!"

The *best* way to assure comfort in any building is to insist on Honeywell controls.

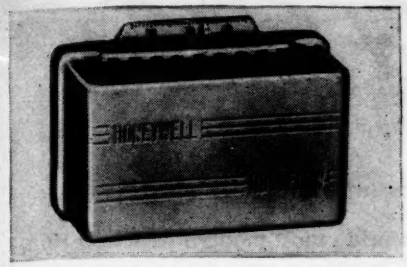
If *you* have a control problem, Honeywell can help provide the proper thermal environment for any client–anywhere–in any kind of structure.

A large staff of well-informed control engineers –in 91 different Honeywell offices across the nation–are experienced in doing just that. Or–there's a lot of literature that's yours for the asking–on the automatic control of heating, ventilating and air conditioning

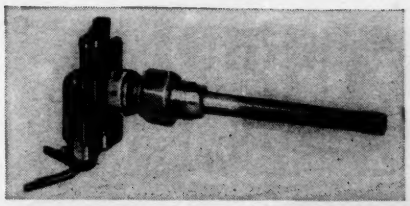
So–why not *talk to Honeywell?* Why not *write to Honeywell* about *your* control problem? And why not do it *now?*

H HONEYWELL

For help with any control problem talk to Honeywell



Room Thermostat. No moving parts to wear out or get out of adjustment.



Duct and Immersion Thermostat. Measures temperatures accurately from −50 degrees to 300 degrees F.

For all types of commercial and institutional structures, install

Honeywell Electronic Air Conditioning Control

Give your clients the ultimate in comfort— and increased efficiency, lower maintenance costs

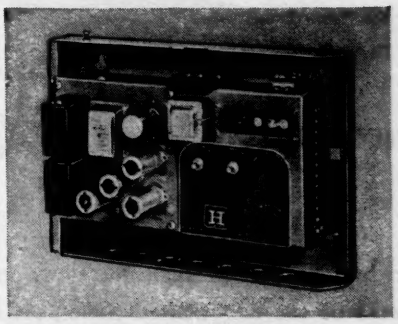
Now, this new type of air conditioning control enables you to offer clients comfort and efficiency never before possible!

You see, this new Honeywell system electronically "feels" temperature changes as they occur and then gives *fast*, accurate modulating control over heating and air conditioning dampers or valves.

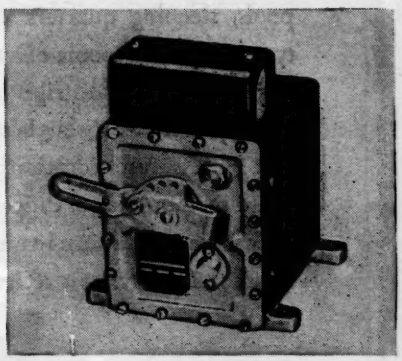
Because it is *electronic*, it's vastly more sensitive than other systems! This means faster reaction to load changes; no temperature "overshoot"; no waste of warm or cool air.

It *allows new methods of operation* so equipment can be utilized at *peak* efficiency at all times! For example, change-over from heating, ventilating and cooling is accomplished smoothly, without "jumps" in the control point. Its *flexibility* allows selection of the most economical sequencing of valves and dampers. And its *simplicity* cuts maintenance costs to a minimum.

Select this new Honeywell *electronic* air conditioning control to give your clients this wonderful comfort and low maintenance costs!



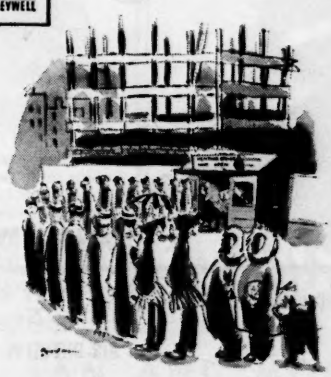
Electronic Relay. Here's the famous "brain" that measures thermostat signals, operates the valves and dampers.



Modulating Motor. Slightest temperature fluctuation causes motor to change valves or dampers.

MINNEAPOLIS **Honeywell**

First in Controls



...applicants are coming from all over since they heard (your firm name) installed the heating system.

FREE—*personalized cartoon. For your 8½" x 9" reproduction of this Goodman cartoon (incorporating your name or the name of your firm), fill out and mail coupon today.*

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HV-7-164, Minneapolis 8, Minnesota

☐ Please send me a free personalized reproduction of the Goodman cartoon, inscribed with the following name:

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☐ Please send me your booklet, "New Horizons of Comfort with Honeywell Electronic Air Conditioning Control."

*Name*_____

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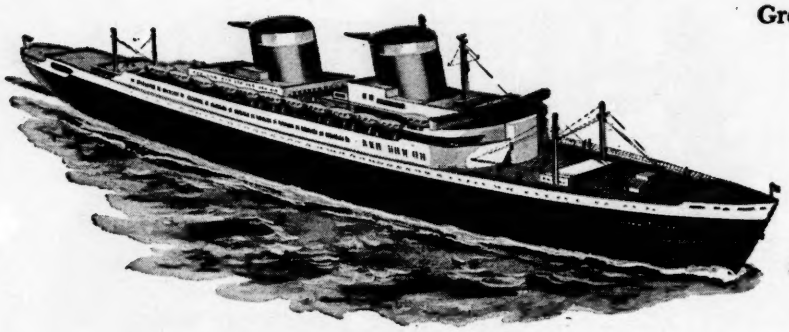
ABOARD THE SS United States



Great new superliner S.S. United States, world's most modern passenger ship, largest, fastest ever built in this country. It introduces new standards in maritime engineering construction and decoration . . . the very cream of America's resources and skills.

YOU'LL FIND AN Air of Luxury

In hundreds of strategic locations on the seven decks of the S.S. United States, AGITAIR air diffusers provide 100% air distribution. They assure luxurious comfort in theatres, lounges, dining rooms, salons, shopping centers, swimming pools, sleeping quarters and every conceivable type of space. Rooms of varied sizes and shapes have draftless air distribution even though structural conditions throughout the ship determine and limit diffuser locations. The many problems posed by hundreds of different areas were successfully solved by pattern-made Type R AGITAIRS. Write today for latest technical data.

AIR DEVICES Inc.

17 East 42nd Street
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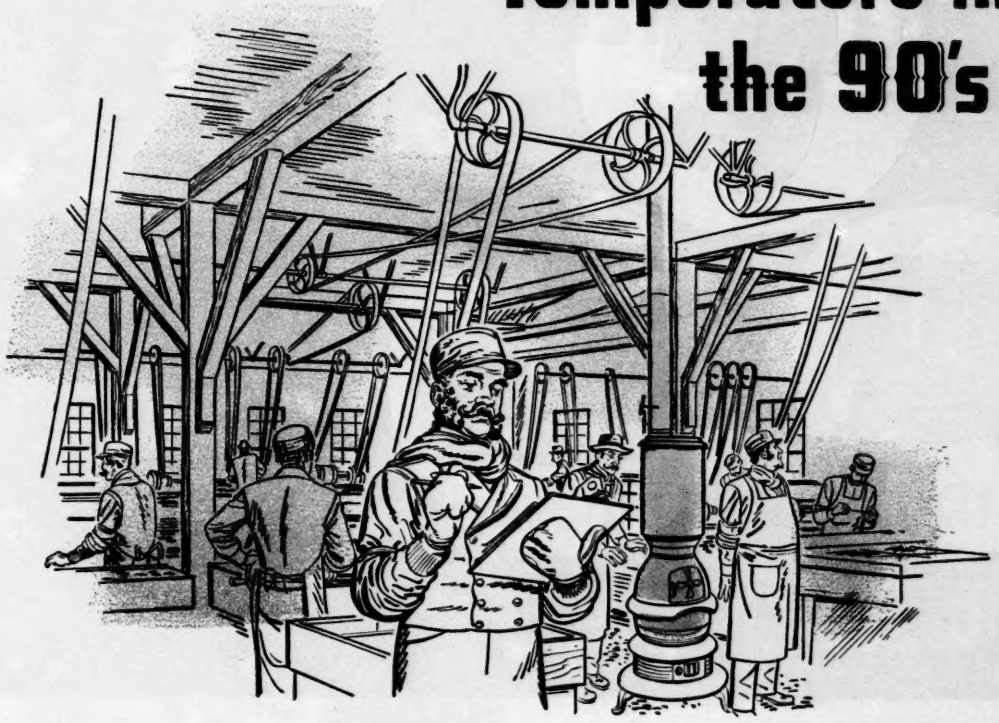
AIR DIFFUSERS • FILTERS • EXHAUSTERS

Efficiency Dropped with the Temperature in the 90's

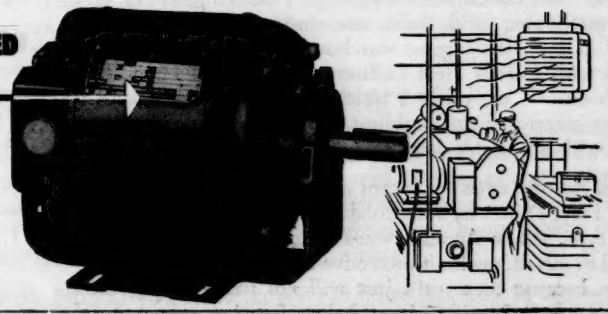


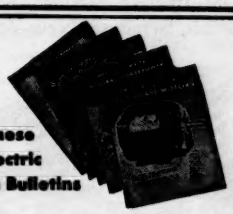
Cold hands put a "frostbite" on production efficiency in the 1890's. Today, efficient unit heaters force billows of warm air to every corner of even the largest plants. The temperature stays up . . . so does worker efficiency.

Mechanized plant heating is just one of the factors, selected from a multitude of industrial applications for motor power, which has contributed to the present era of mass production methods.

Ever since its founding in 1890, Emerson-Electric has specialized in building dependable motors for equipment used in industry, on the farm, in business, and in the home. There is a complete line of Emerson-Electric motors in ratings from 1/20 to 5 horsepower. Your inquiry is invited. THE EMERSON ELECTRIC MFG. CO., St. Louis 21, Mo.

MODERN INDUSTRY IS POWERED WITH ELECTRIC MOTORS





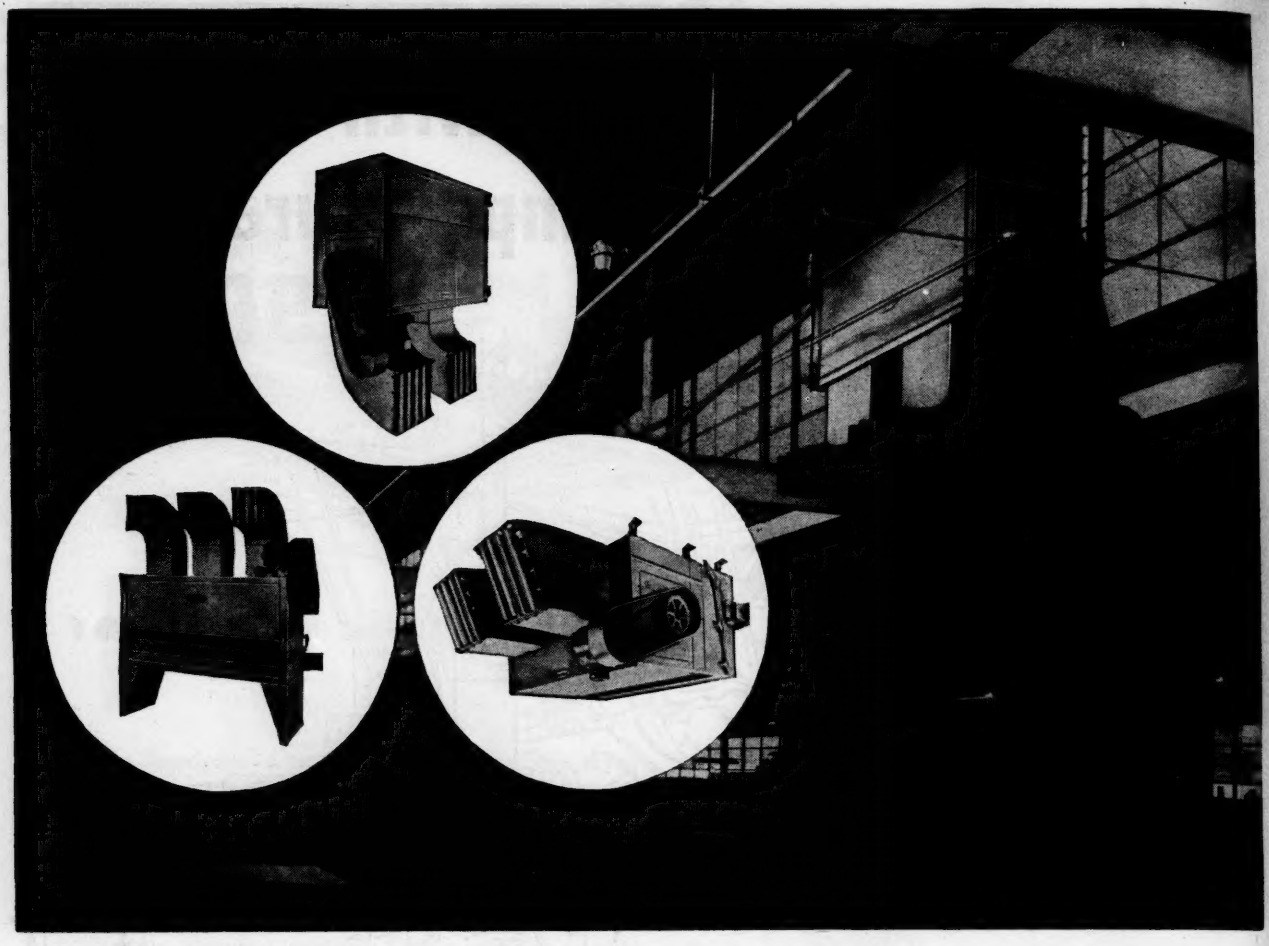
Write for these Emerson-Electric Motor Data Bulletins

Manufacturers requiring motors 1/20 to 5 h.p. can profitably use these reference guides. Specifications, construction and performance data are included for these motors:

- ☐ M139-A Capacitor-Start
- ☐ M139-B Split-Phase
- ☐ M139-C Integral
- ☐ M139-D Fan-Duty
- ☐ M139-E Oil-Burner
- ☐ M139-F Jet Pump
- ☐ M139-G Blower

EMERSON ELECTRIC
MOTORS • FANS
APPLIANCES

LEADERS IN THE FAN AND MOTOR INDUSTRY SINCE 1890



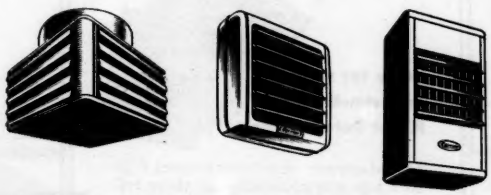
I. S. Berlin Press finds Carrier gives better heat for bigger buildings

It's the larger spaces that put heating units to a real test. That's why the I. S. Berlin Press, 3201 N. Kimball Ave., Chicago, relies on Carrier blower-type Heat Diffusers to heat their warehouse. Cold floors and drafty corners are never around in even the biggest warehouses, hangars, factories or garages with Carrier Heat Diffusers on the job. They bring in fresh outside air, warm it quickly and evenly, and send it to every cranny of the building through multiple discharge outlets with adjustable louvers.

Famous Aerofin coils for steam or hot water, as used in all Carrier Heat Diffusers, are available in either U-bend or Non-Freeze type. When Aerofin Non-Freeze coils are used, there's no need to install low limit protective controls or to temper outside air, because these coils just *will not freeze,* even when handling 100% outside air at below freezing temperature!

Another advantage: Carrier Heat Diffusers are of sectionalized construction, easily installed, and can be readily rearranged for floor, wall or ceiling mounting.

For steam or hot water Carrier blower-type Heat Diffuser models 46P, Q, R are available in 6 sizes, to 2,390,000 Btu's per hr. at 2-lb. steam. Air-handling capacities to 31,000 cfm. Write for our informative catalog, "Carrier Heat Diffusers." Carrier Corporation, Syracuse, New York.



For smaller spaces, Carrier propeller-fan type Unit Heaters: Four-way Directed-flo vertical discharge model 46S (left), 7 sizes, 82,000 to 500,000 Btu's, for steam or hot water; horizontal discharge model 46U (center), 10 sizes, 21,000 to 200,000 Btu's, for steam or hot water; and gas-fired model 46T (right) and 46TD (duct type, not shown), 7 sizes, 70,000 to 230,000 Btu's, AGA-approved for all gases.

Carrier

Air Conditioning • Refrigeration • Industrial Heating

ILLINOIS
Float & Thermostatic TRAPS

ILLINOIS Float & Thermostatic Traps operate under vacuum with the same high efficiency as under pressure. No more water-logging of mains . . . no more air binding . . . end "morning overload" troubles. The instantaneous action of the condensate valve assures complete drainage of condensate. A separate thermostatically controlled valve vents air continuously in large volume, yet positively prevents loss of steam.

Recommended Applications

Low Pressure Heating Systems, Ventilating Units, Unit Heaters, Pre-Heaters, Re-Heaters, and other Fan System Heat Surface, Large Radiators or Pipe Coils, Hot Water Generators, Drips of Mains and Risers. Draining Coffee Urns, Warming Tables, Pasteurizers, Vacuum Pans, Heat Exchangers, Process Heaters, Sterilizers, Autoclaves, Cooking Kettles, Kilns and similar equipment.

(For operating ranges from 25 inches vacuum to 15 pounds pressure use Series G Traps. For pressures up to 50 pounds use Series MG.)

Rated capacities of various size traps from 200 pounds to 5000 pounds condensate per hour, at 2 pounds differential across the trap.

Positive, Instantaneous Valve Action . . . an Exclusive Feature

The Snap Action of the Condensate Control Valve assures efficient trap operation. The valve is not directly attached to float but is actuated by impact of the dropping float. Valve action is instantaneous whether the trap is handling its maximum capacity or only a trickle of condensate and regardless of variation in pressures. The valve is either wide open or tight shut—never cracked on seat, never hanging in an intermediate position. It is water-sealed at all times. It cannot chatter and is never affected by pulsations in the flow of condensate to the trap.

Simple, Compact, Trouble-proof

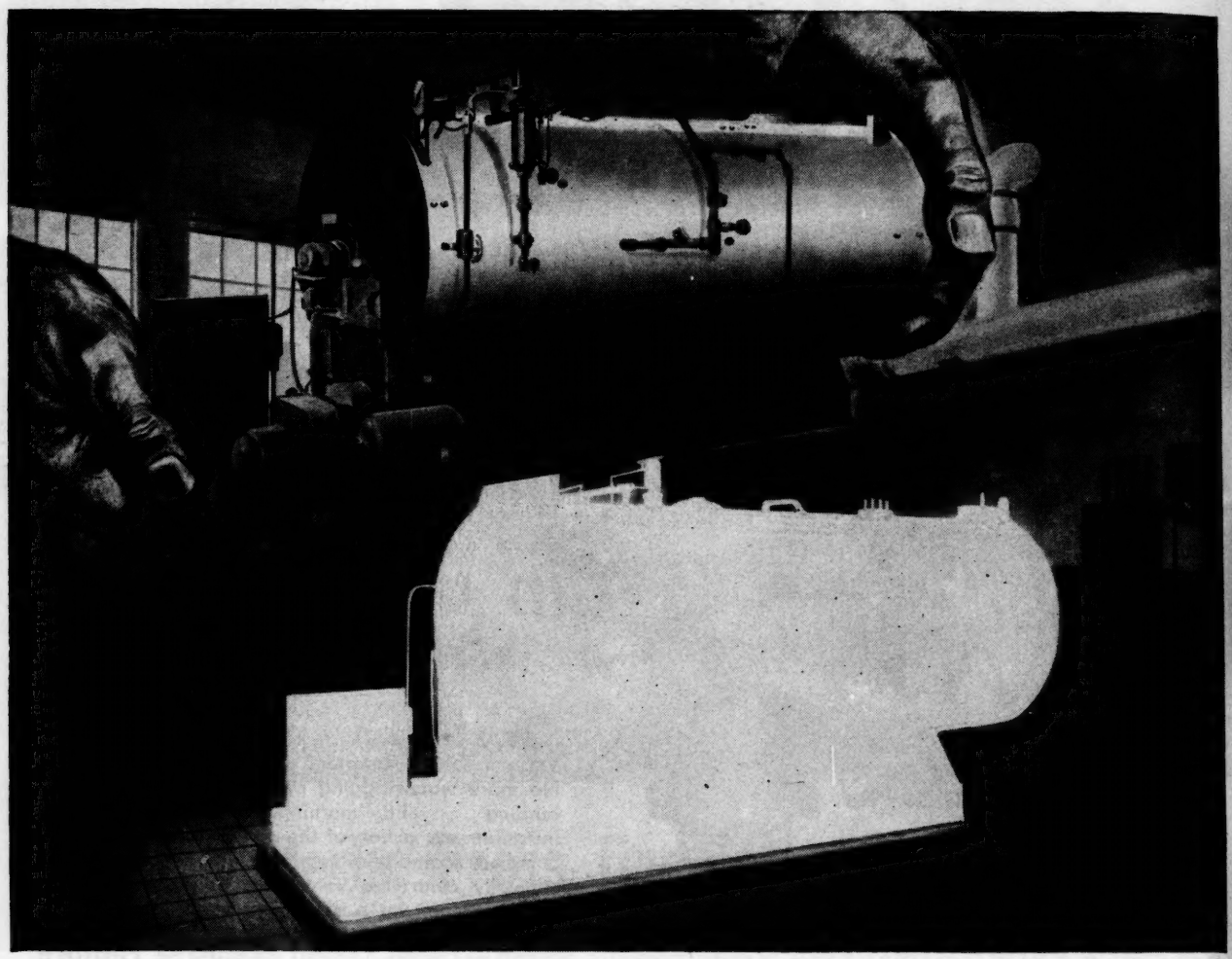
No ball floats to puncture or collapse—no toggles, pins, levers or hinges to corrode, stick or bend. Hard, stainless alloy steel renewable valves and seats are used for both condensate and air bypass units. Both valve units are at the top of trap out of dirt and sludge, assuring long life and satisfactory operation without attention. Straight through connections save head room, fittings, trenching, labor, and avoid low hung piping or lifts. Trap is easily opened for inspection without disturbing piping.

TRAP NOT DAMAGED BY FREEZING. Freezing will not harm this trap in any way and it is self-thawing.

Write for Bulletin 34-C

ILLINOIS ENGINEERING COMPANY
INCORPORATED 1900
RACINE AVENUE AT 21ST STREET •• CHICAGO 8

Ready when you need it...



Save Installation-Construction Time — Expedite Emergency Installations — Serve Immediate Temporary Steam Needs — With a Cleaver-Brooks Self-Contained Boiler

WHEN speed is vital, you can save weeks of valuable installation time with a Cleaver-Brooks boiler — delivered to location as a complete, factory assembled and tested, self-contained unit, with much of the trim and accessories provided.

In an emergency the installation time can be reduced to as little as 48 hours, by following a properly planned and coordinated procedure of providing in advance the required facilities — foundations, headers, service and blow-off lines, fuel tanks and lines.

Prior to the completion of your building, Cleaver-Brooks boilers can be placed in operation to serve immediate steam needs. When permanently installed the change-over takes place with a minimum of labor and expense and the avoidance of interrupted steam service.

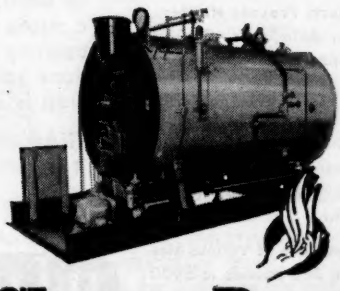
Cleaver-Brooks are the first and finest in modern, self-contained boilers — operate at a guaranteed efficiency of 80% — burn the fuel most available and economical in your area, gas, oil, or combination gas and oil — fully meet all codes — standard models available in sizes 15 to 500 hp; 15 to 250 psi.

CLEAVER-BROOKS COMPANY
Originators of the Self-Contained Boiler
Dept. H-314 E. Keefe Ave., Milwaukee 12, Wis., U.S.A.
Cable Address: Clebro-Milwaukeewis

Write for latest, fully illustrated and descriptive Cleaver-Brooks Steam Boiler Catalog.

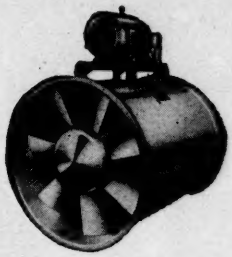
WHY INSTALLATION TIME IS CUT:

- Simple Low-Cost Stack
- No Job-Site Brickwork — No Special Foundations
- Boiler Delivered as a Complete, Factory Assembled, Tested, Self-Contained Unit
- Centralized Responsibility — No Waiting on Multiple Sources of Supply

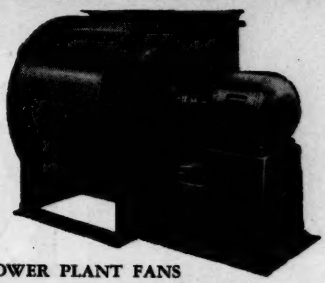


Cleaver-Brooks

Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil and Gas-Fired Conversion Burners



AXIAL FLOW FANS



POWER PLANT FANS

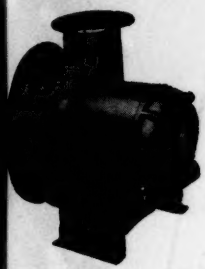
BREEZO FANS

LIMIT-LOAD FANS

75 years of building dependable air handling equipment

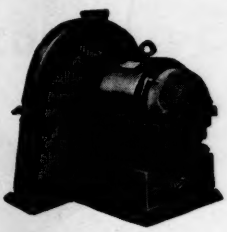
VOLUME FANS

BELTED VENT SETS



TYPE "CB" PRESSURE BLOWERS

RE BLOWERS-EXHAUSTERS



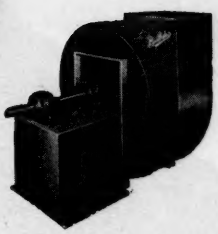
TYPE "CC" PRESSURE BLOWER

Efficient Air Handling Units
To Satisfied Customers
Since 1877

We welcome the opportunity to solve *your* problem.

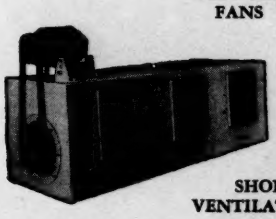
BELT AIR FANS

BABY CONOIDAL FANS



INDUSTRIAL EXHAUSTERS

"E" BLOWERS-EXHAUSTERS



SHORTBOY VENTILATING SETS

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

480 BROADWAY BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

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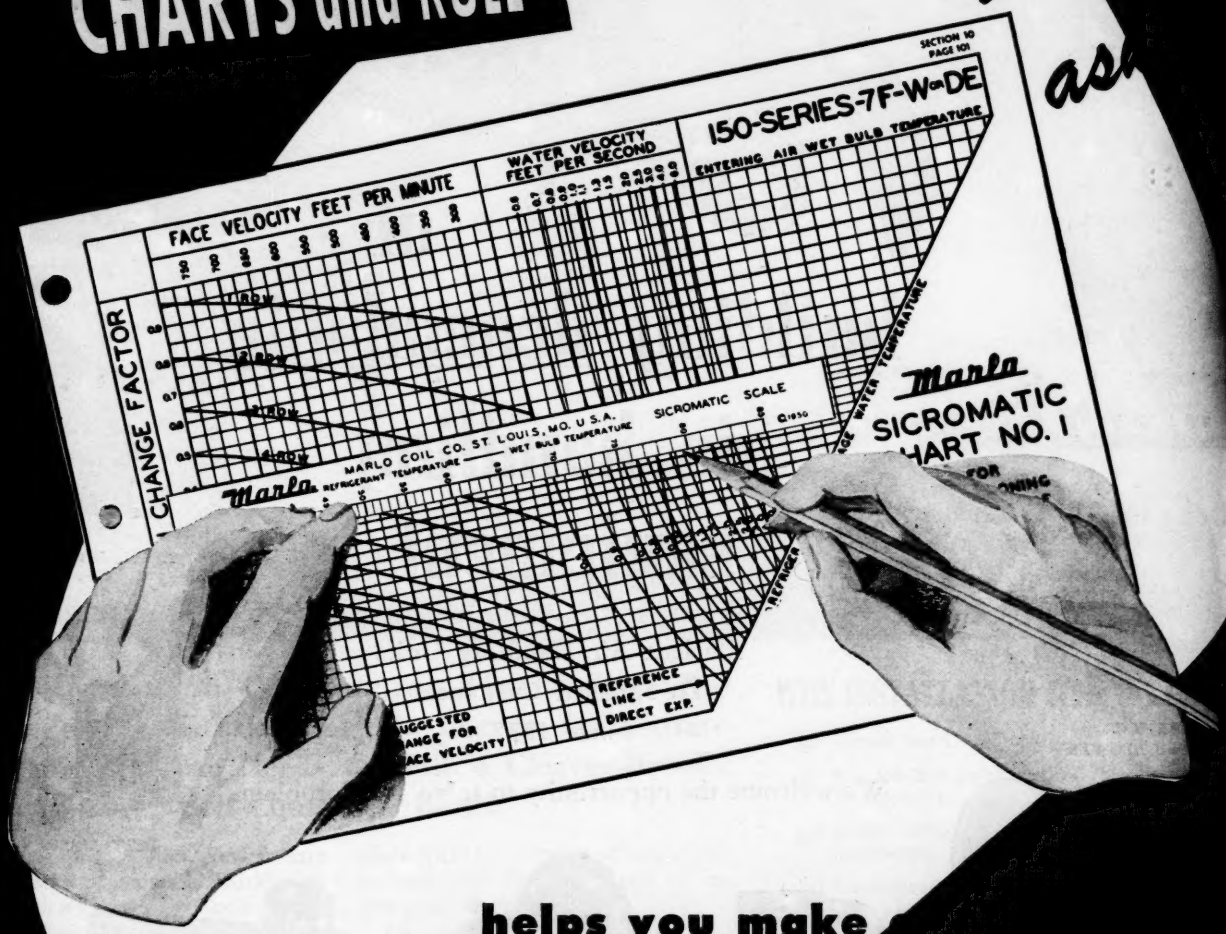
Marlo SICROMATIC CHARTS and RULE



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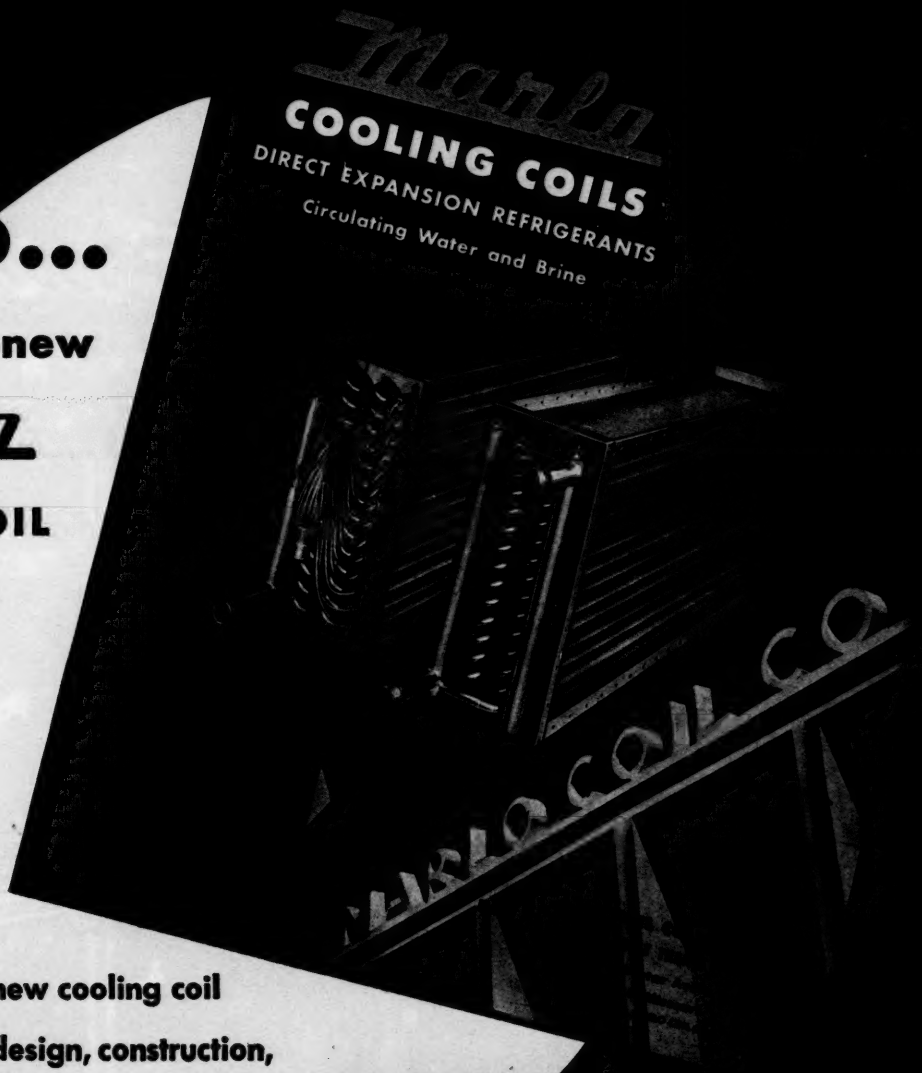
COOLING COIL

BULLETIN



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MARLO COIL COMPANY

6134 MANCHESTER • ST. LOUIS 10, MISSOURI

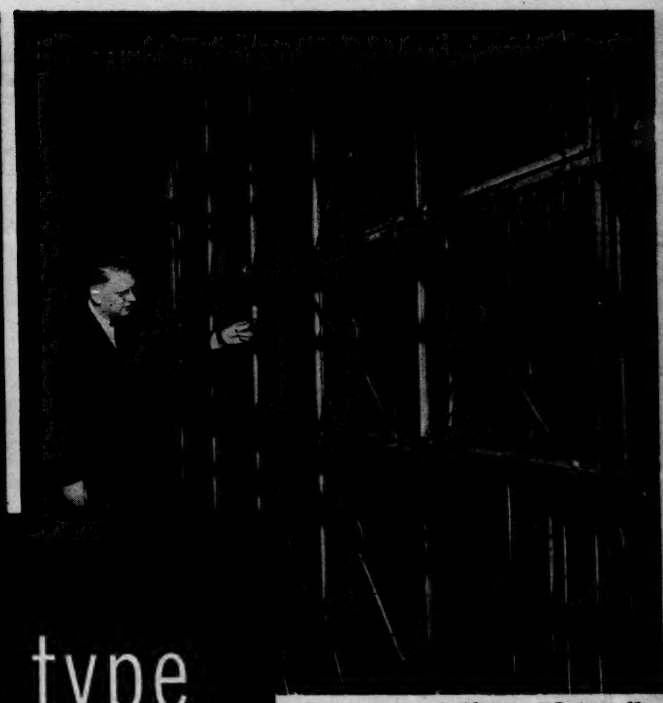
Please send your new Sicromatic Chart combination and cooling coil bulletin to:

Name_____ Position_____

Company_____ Address_____

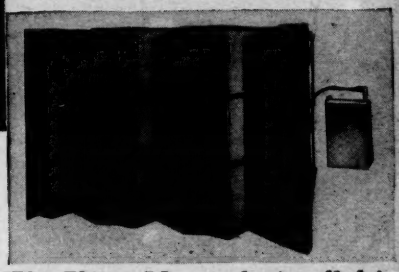
City_____ Zone_____ State_____

An Electro-PL installation of 25,000 cfm cleaning the air for a large Midwest library to protect rare books and manuscripts. The operator is removing a collector element for servicing.

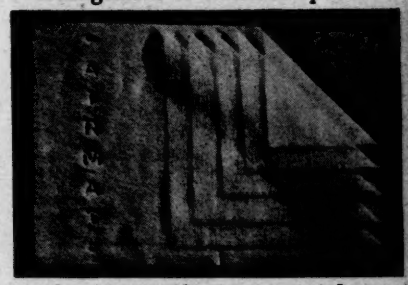


...the only dry type electronic air filter

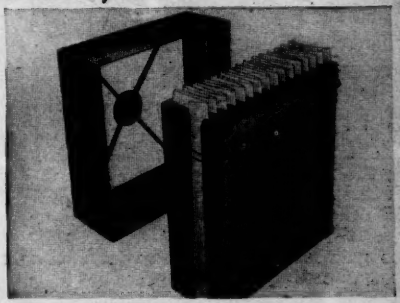
Rear view of Electro-PL installation showing electrical connections to individual units.



The Electro-PL may be installed in V-arrangement to conserve space.



6 ply Airmat filtering material composed of porous tissue-thin sheets of cellulose fibers.



Electro-PL Unit consists of frame and collector element.

ELECTRO-PL gives twice the filtering efficiency of ordinary dry filters . . . at low initial cost.

The Electro-PL is an exclusive development of AAF engineering research.

The many advantages and low initial cost of the Electro-PL account for its broad applications in both industry and commerce. Engineered for simple, economical maintenance, it requires no water and sewer connections . . . needs no oil to retain precipitated dust. The Electro-PL is easy to install, safe to operate, and becomes essentially a new filter each time the Airmat media is renewed. Another important "safety" plus is that the Electro-PL maintains efficient air filtration even when there are power failures.

For information on Electro-PL call your local AAF representative or write direct to us for our Engineering Bulletin No. 257.

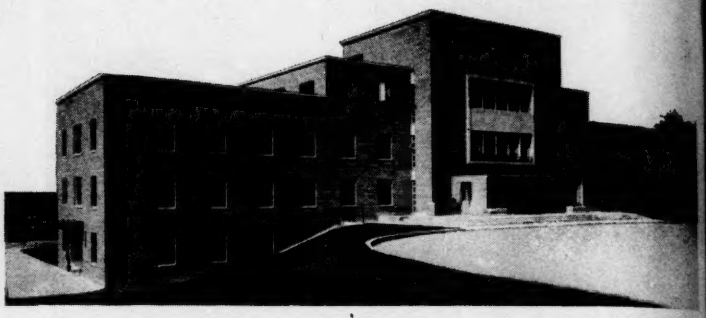
American Air Filter
COMPANY, INC.

294 Central Avenue, Louisville 8, Kentucky

American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, Cal.

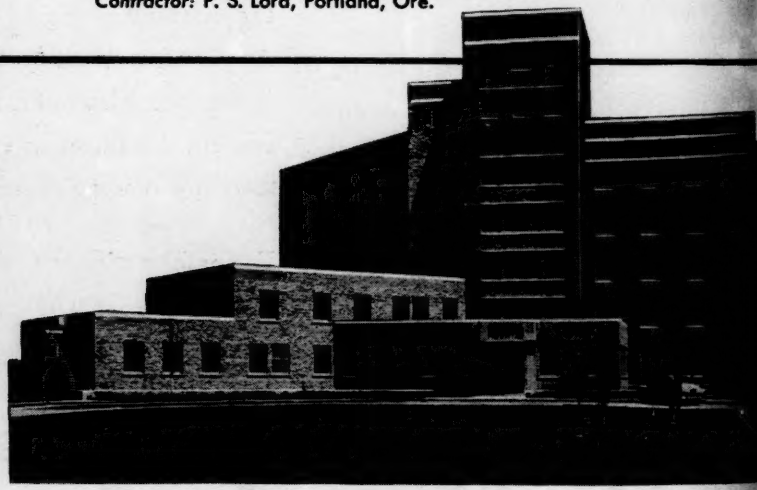
PROMINENT CONTEMPORARY HOSPITALS USING

POWERS *Pneumatic* Temperature and Humidity Control



Little Traverse Hospital, Petoskey, Mich.
Architects: Skidmore, Owings & Merrill, Chicago
Consulting Engineer: Samuel R. Lewis, Chicago
Contractor: Lansing Heating & Ventilating Co., Lansing, Mich.

Male Ward Building, Western State Hospital, Fort Steilacoom, Wash.
Architect: A. Gordon Lumm, Tacoma, Washington
Engineer: James B. Notkin, Seattle, Wash.
Contractor: P. S. Lord, Portland, Ore.



St. Joseph-Benton Harbor Memorial Hospital, St. Joseph, Mich.
Architects: Fugard, Burt, Wilkinson & Orth, Chicago
Contractor: Northwestern Heating & Plumbing Co., Evanston, Ill.

d Lowest Maintenance Cost Use POWERS Con

THE POWERS REGULATOR COMPANY

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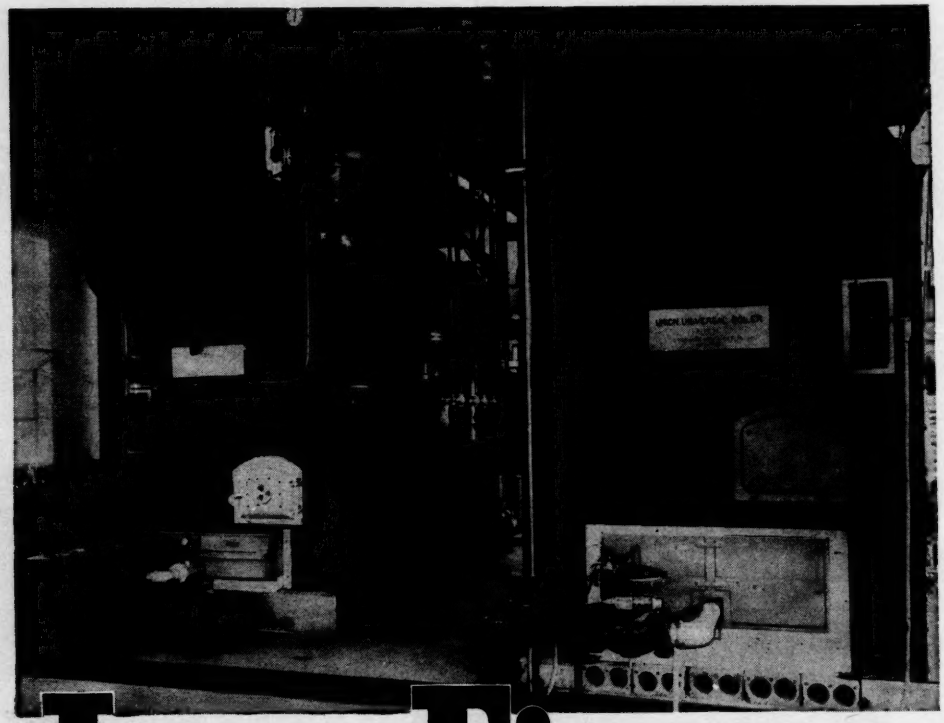
GENERAL OFFICES AND FACTORY—SKOKIE, ILLINOIS

POWERS CONTROL

"Our Iron Fireman Gas Burners maintain a more even steam pressure and save manpower"

says Mr. O. Carlyle Brock
President, Sanida Sanitary Farms Dairy, Inc.
Erie, Pennsylvania

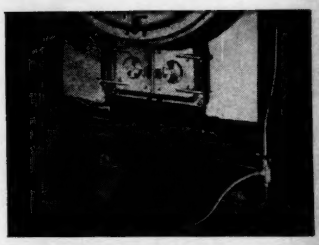
"Our original boilers were coal fired, and since changing to your gas burners, we can maintain a more even steam pressure and are experiencing considerable savings in manpower. Our load changes quite rapidly and at no time have we been held up for lack of steam. We are also able to maintain a clean boiler room which is quite important in dairy operations."



Both boilers at Sanida Dairy (100 h.p. and 150 h.p.) are fired by Iron Fireman GCV vertical-type Gas Burners. Zone fire control permits low-fire start and self-adjusting modulated firing. Automatic damper controls enable rapid heat response.

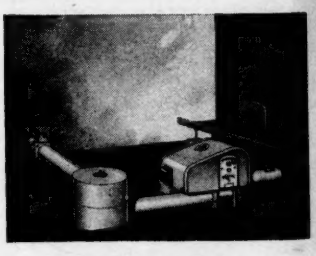
Iron Fireman Gas Firing for heating, power, or processing

Iron Fireman gas firing is saving users many fuel dollars. "Control" is the answer—control of the fuel-air ratio for the most efficient combustion; *control* of the firing rate to instantly adjust to the load; and *control* to compensate for varying pressures in the gas supply. No other gas firing gives such outstanding performance and savings. They are available in three styles—inshot burners, vertical-type burners, and ring-type burners, for boilers up to 1,000 horsepower. Find out how much an Iron Fireman can save for YOU. Phone your nearest dealer or send the coupon below for descriptive literature.



Horizontal Rotary Oil Burner

Fires low-cost, heat-rich heavy oils (Nos. 5 and 6) with complete steadiness and dependability. Oil feed rate is constant, even with changes in viscosity of oil.



Coal-Flow Stoker

Feeds coal direct from bin. No coal handling. Synchronized coal and air supply automatically adjusted to boiler load at all times. Capacities to 400 boiler h.p. Pneumatic Spreader models also available.

MAIL COUPON FOR FULL INFORMATION

IRON FIREMAN MFG. CO. 3279 W. 106th Street, Cleveland 11, Ohio

Please send literature as checked:

- ☐ Commercial Gas Burners
- ☐ Coal-Flow Stokers
- ☐ Rotary Oil Burners
- ☐ Pneumatic Spreader Stokers

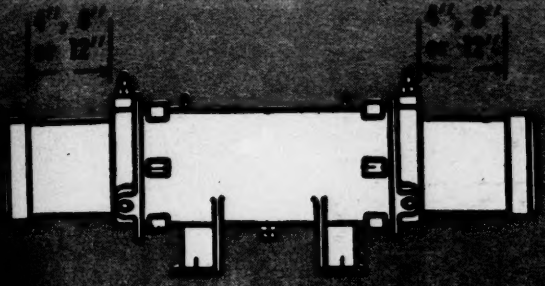
Name_____

Address_____

City_____ State_____

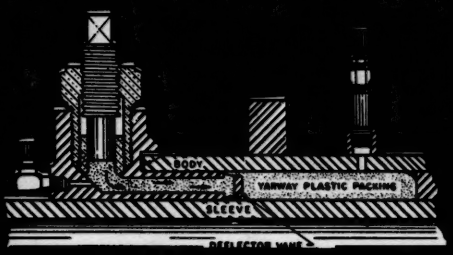
AUTOMATIC FIRING FOR HOMES, BUILDINGS, INDUSTRIAL PLANTS

YOU NEED FEWER JOINTS

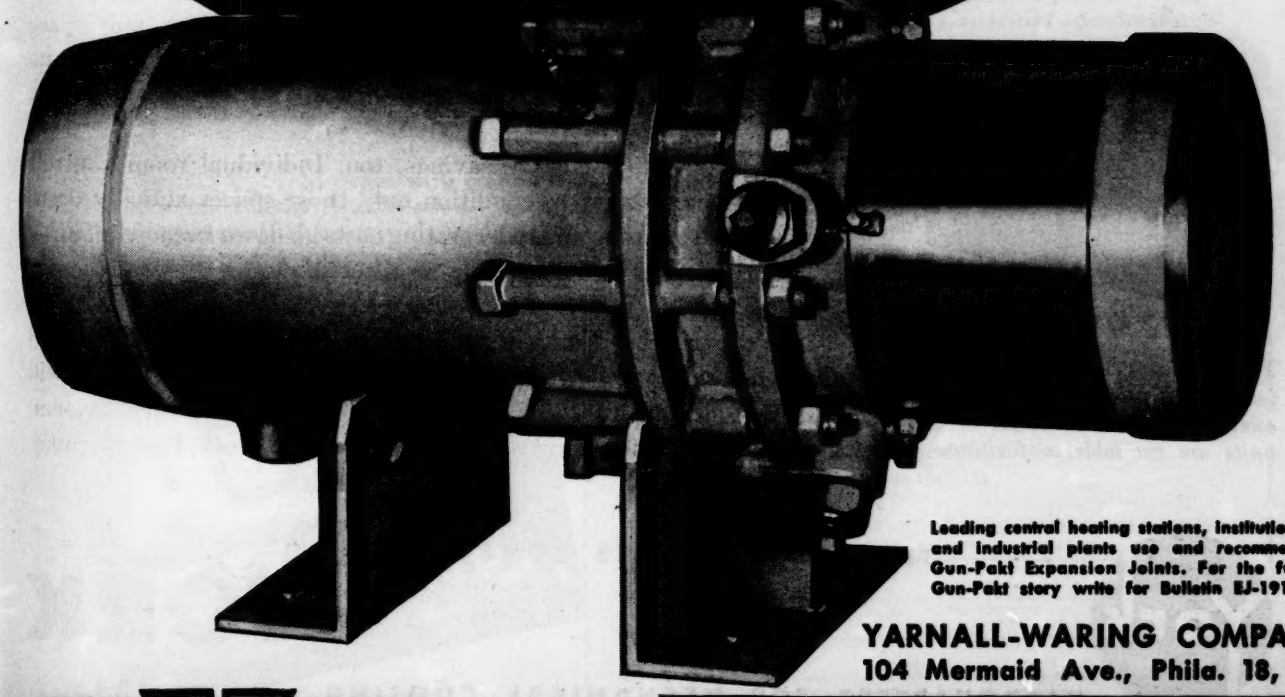


With Yarway Gun-Pakt slip-type expansion joints you need fewer joints than with other types. Standard joints absorb from 4" to 8" or 12" of expansion depending on size and pressure. Special joints are available for greater movement.

AND LESS MAINTENANCE



GUN-PAKT



Leading central heating stations, institutions and industrial plants use and *recommend* Gun-Pakt Expansion Joints. For the full Gun-Pakt story write for Bulletin EJ-1912.

YARNALL-WARING COMPANY
104 Mermaid Ave., Phila. 18, Pa.

YARWAY GUN-PAKT EXPANSION JOINT

YORK *Unitary* AIR CONDITIONING gives you greater freedom in design and space

In the new block-long offices of Smith, Kline & French, Inc. (leading wholesale druggists), York Unitary Air Conditioning provides offices with individual control of cooling and heating.

Another York-Sized Job—the warehouse of Smith, Kline & French, Inc.—a single, block-long room—is believed to be the world's largest fully air-conditioned commercial room.

Whether you're renovating an already existing structure or building a new one, York Unitary Air Conditioning saves you space and helps simplify your design problems.

For example, you can locate outside air intakes anywhere from windowsill to floor level. Only three pipes—water supply and return, and drain—are necessary. In the engine room, only space for a central water supply system is required. And there's no additional air handling equipment with the York Unitary System.

Your client will enjoy savings, too. Individual room controls allow management to condition only those spaces actually occupied. And cleaning and redecorating costs go down because all air—recirculated as well as outside—is filtered.

York Unitary Air Conditioners may be installed to provide heating initially and cooling added later. Right or left-hand units are available to facilitate piping.

Your nearby York Representative (listed in your Classified Directory) can add fact after fact to those above—facts that will surely demonstrate the superiority of York's Unitary System. Consult him today or write York Corporation, York, Pennsylvania.

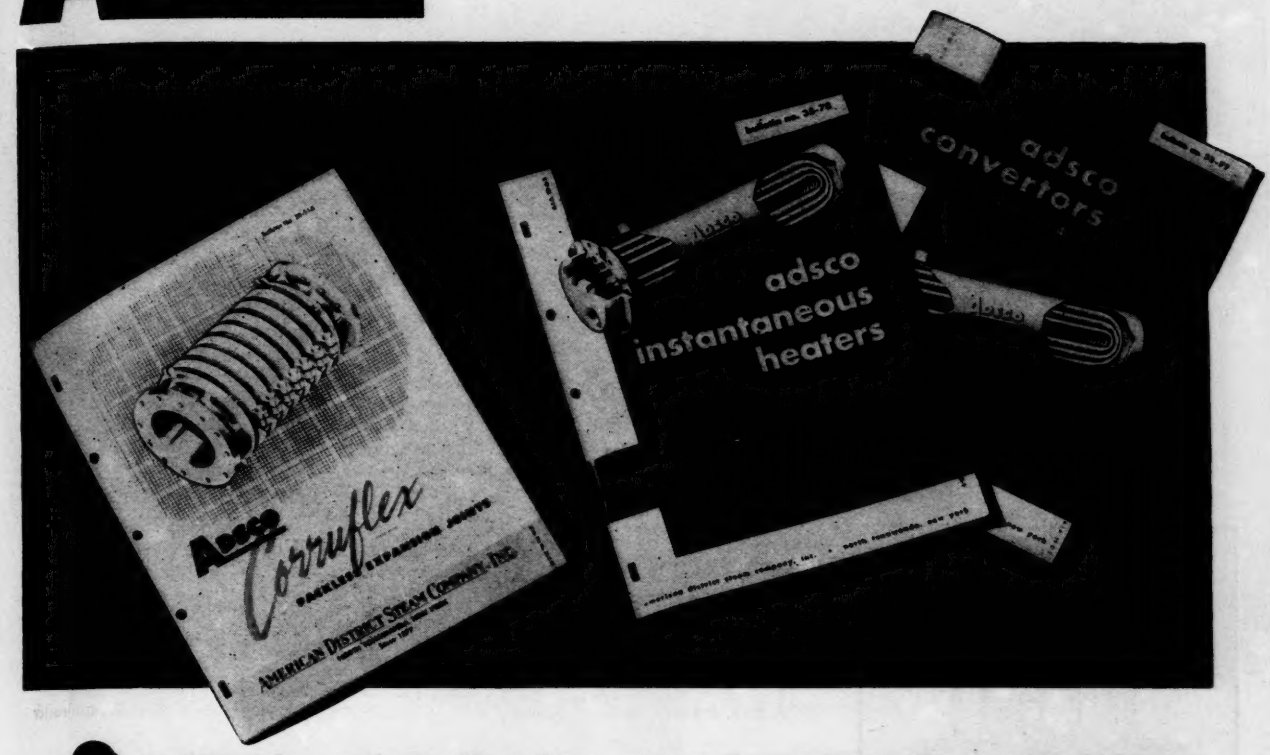
THE BIG ADVANCES COME FROM

YORK

York refrigeration air conditioning

HEADQUARTERS FOR MECHANICAL COOLING...SINCE 1885

ADSCO TECHNICAL BULLETINS



3 NEW BOOKS JUST PUBLISHED SEND FOR YOUR COPIES *TODAY!*

● Adsco's three new bulletins—one on Corruflex Packless Expansion Joints, one on Instantaneous Heaters, and one on Convertors—are the most authoritative in the industry. These new bulletins will provide ready information you will always need. *Here they are:*

1. CORRUFLEX . . . 28 pages with complete information on selection, specifications, and installation; 9 pages of tables on weights and dimensions. Drawings of 3 typical piping arrangements; 29 drawings of basic joints and their variations.

2. INSTANTANEOUS HEATERS . . . 56 pages, with 49 pages of tables. Capacities and pressure drops for 198 heaters at 9 steam pressures and 12 temperature ranges. Special information and tables on coolers and on booster, swimming pool and other types of heaters.

3. CONVERTORS . . . 32 pages, with 24 pages of tables. Capacities and pressure drops for 148 convertors at 7 steam pressures and 15 temperature ranges. Detailed instructions on how to select a convertor. Special charts and information on problems related to convertors.

ADSCO
75 YEARS OF LEADERSHIP

MAIL THIS COUPON TODAY!

AMERICAN DISTRICT STEAM COMPANY, INC. Dept. HV-7
North Tonawanda, N. Y.

Please send me the bulletins checked:

- ☐ Corruflex Packless Expansion Joints
- ☐ Instantaneous Heaters
- ☐ Convertors

*Name*_____

*Company*_____

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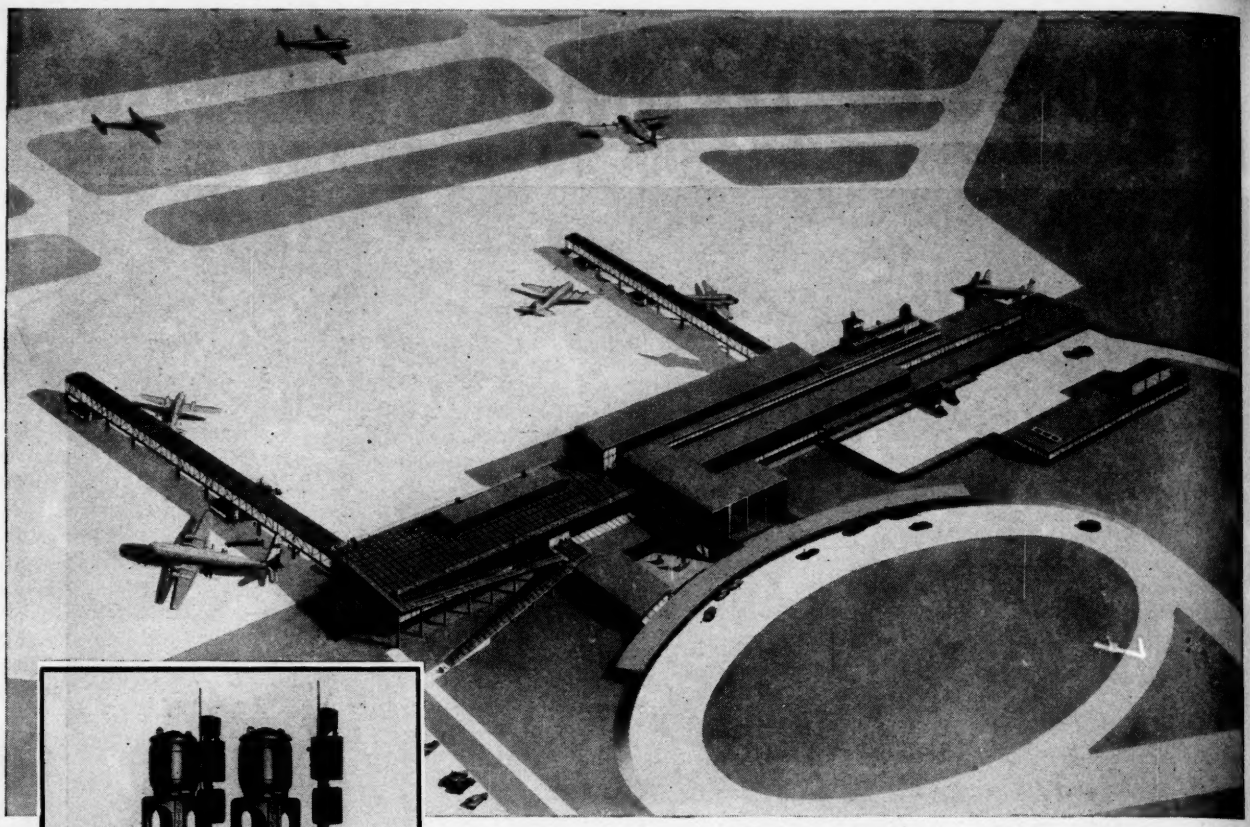
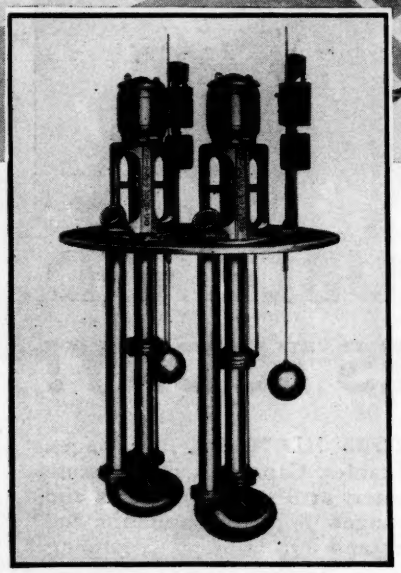


Carroll, Grisdale & Van Alen, Architects
A. E. D'Ambly, Structural Engineer — L. E. Winter & Company, Contractor



To assure efficient and trouble-free service Engineers for Philadelphia's International Airport choose CHICAGO NON-CLOG PUMPS

—14 DUPLEX SETS—

In selecting the sewage and sump pumps for Philadelphia's Airport Terminal Chicago Non-Clog Pumps were specified. The large volume of traffic with heavy peak loads at arrival and departure time made it essential that reliable, heavy duty pumps be used. The Chicago Non-Clog with a background of 43 years of rugged dependable service, was the logical choice. 28 pumps, in basins of 14 duplex sets, pump the sewage and bilge from this new and modern airport terminal.

Philadelphia's great new international airport is one of the finest in the world. The modern terminal building incorporates the latest in design and lay-out for easy and efficient handling of passenger traffic.

In planning the structure, the architects wisely provided for future growth. At the present rate of expansion it is expected that by 1960 about 613,000 passengers per year will use the terminal. Both at present and with this expected volume of traffic, Philadelphia's airport will rank among the first 20 in the country, both as to number of planes and number of passengers using the airport. Carroll, Grisdale & Van Alen, Architects. A. E. D'Ambly, Structural Engineer. L. E. Winter & Company, Contractor.

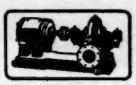
CHICAGO INDUSTRIAL PUMPS

CHICAGO PUMP COMPANY

BUILDING and INDUSTRIAL DIVISION

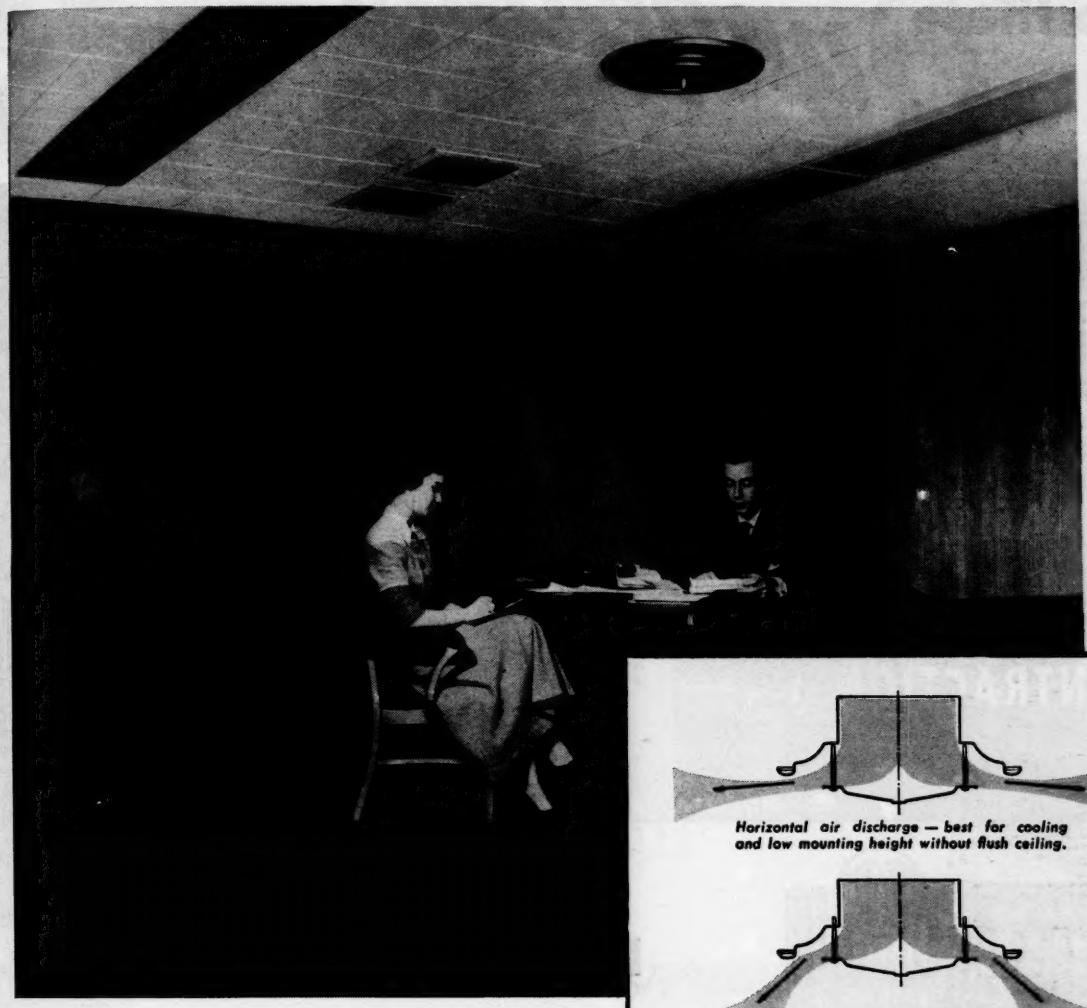
622 DIVERSEY PARKWAY — **CHICAGO 14, ILLINOIS**

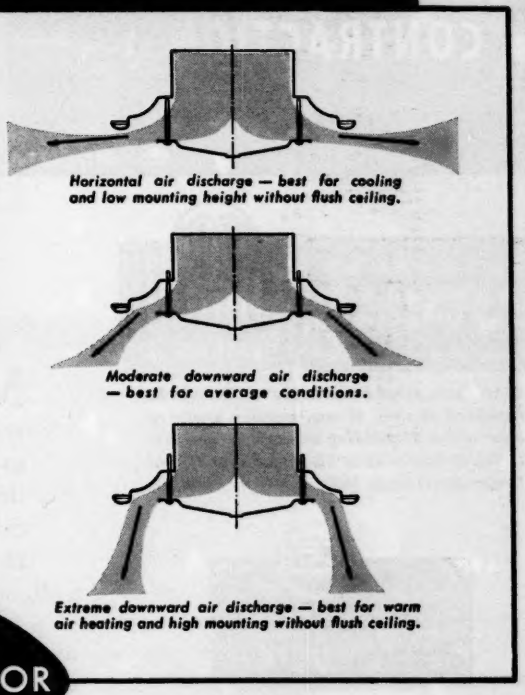
Condo-Vac, Sure Return. AVC, LVC, Fire, House & Circulating Pumps Pneumatic & Tankless Water Systems.



Flush-Kleen Sewage Ejectors Little Giant & Non-Clog Bilge Pumps Pumps for every industrial use.

Seneca Textile's new building, New York City. *Architects and Engineers:* Alfons Bach, Inc. *Contractors:* George A. Fuller Co.





Horizontal air discharge — best for cooling and low mounting height without flush ceiling.

Moderate downward air discharge — best for average conditions.

Extreme downward air discharge — best for warm air heating and high mounting without flush ceiling.

Handsome air diffusers that do a better job

With no other tool than a screw driver, you can easily and accurately adjust the air flow from a Kno-Draft Air Diffuser from horizontal to almost vertically downward—and do it *after* installation.

Think what this can mean in reducing your preliminary figuring for a job . . . and increasing customer satisfaction with the operation of the system. Kno-Draft *Adjustable* Air Diffusers are top performers under all conditions.

Yet adjustability after installation is only one of many reasons why Kno-Draft Air Diffusers are rapidly becoming the preferred units for both commercial and industrial installations.

For the complete Kno-Draft story, mail the coupon today to W. B. Connor Engineering Corporation, Danbury, Connecticut.

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adjustable air diffusers

W. B. CONNOR ENGINEERING CORP.
Dept. J-72, Danbury, Connecticut

Please send me the *new edition* of the Kno-Draft Data Book—without obligation, of course.

Name.....

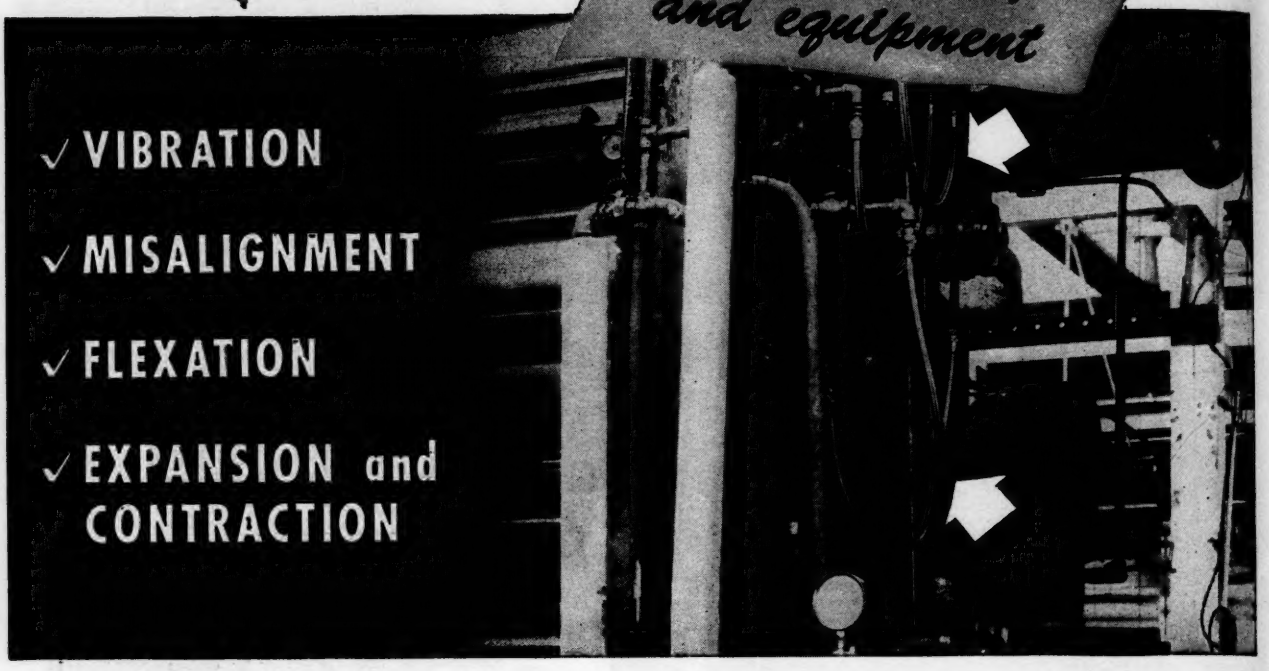
Position.....

Company.....

Street.....

City.....**Zone**.....**State**.....

Keep these *Dangerous* stresses *out of piping and equipment*



CMH Corrugated Flexible Metal Hose can be furnished in steel, bronze, stainless steel and other alloys. Depending on size, type and material, pressures up to 12,000 psi (burst) and temperatures up to 1600° F. can be handled.

CMH Convoluted Metal Hose is made in a variety of types and in steel, bronze and alloys. Depending on size, type and material, pressures up to 500 psi and temperatures up to 600° F. can be handled.

with CMH Flexible Metal Hose

MOTION or misalignment in rigid piping presents serious problems to the plant engineer. Piping subject to these stresses is in a potentially dangerous condition. In most cases these problems can be economically, dependably and safely solved by using CMH Flexible Metal Hose.

As a manufacturer of a complete line of flexible metal hose, CMH can furnish the type of hose best suited to your needs. CMH distributors are located in principal cities. See your classified telephone directory or write for his name. If you would like to have literature describing the CMH line, write for it, mentioning the types of connection problems you have.

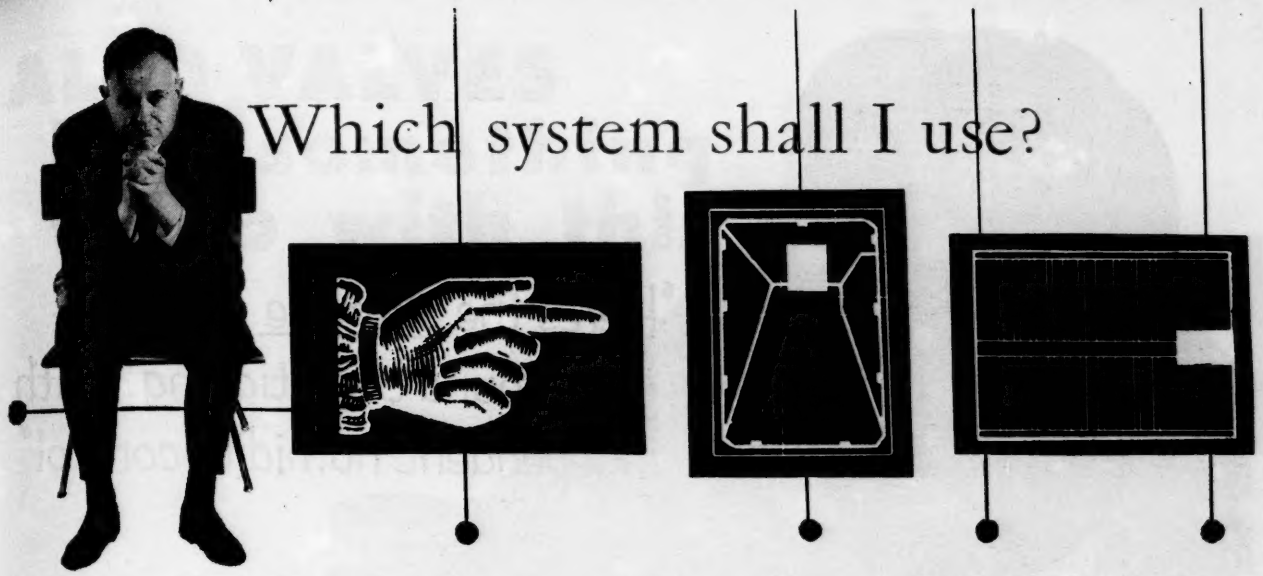
Flexon identifies CMH products that have served industry for over 50 years.

CHICAGO METAL HOSE Division

Flexonics *Corporation*

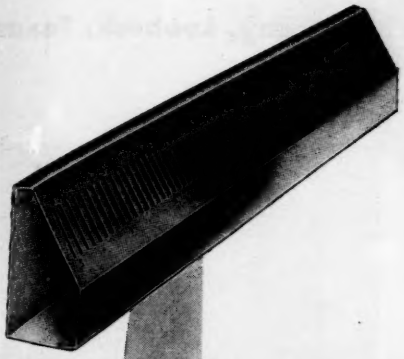
1360 S. Third Avenue • Maywood, Illinois

Manufacturers of Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems • Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario



Which system shall I use?

Standard's perimeter baseboard registers work with them all!



for loop, lateral, crawl-duct, and all other systems, they're best!

Standard's Perimeter Baseboard Registers, illustrated model C-F5, feature all the latest developments of perimeter heating and are the finest, most efficient registers on the market today. Each four-foot section has its own individually operated damper control, easily adjustable for minimum, medium, and maximum volume control. Standard's Perimeter Baseboard Registers spread warm air along the baseboards and do away with concentrated heat drafts that fade to cold spots in room interiors.

features:

- Each section controlled individually.
- Efficient Snap-on end caps.
- Heavy-duty construction of 20-gauge steel.
- Finished in prime coat . . . special finishes on request.
- Simplifies balancing of heating system.
- Comes in 4-foot sections with separate butt straps for continuous installation.
- Set*LOK feature for positive air control available at slight extra cost.

Ideal for use in homes, schools, churches, and commercial installations. Also available as C-F4. Both designs have sliding damper control. Adaptable for year-round air conditioning.

Standard Stamping & Perforating Co.

3135 W. 49th Place Chicago 32, Illinois

For more information, and a copy of Standard's New Pocket Catalogue, showing complete line of registers and grilles, *Mail Coupon Today.*

Standard Stamping and Perforating Co. Dept. V,
3135 West 49th Place, Chicago 32, Illinois

Gentlemen: Please send me more information about Standard's Perimeter Baseboard Registers and a copy of your Pocket Catalogue, at no obligation to me.

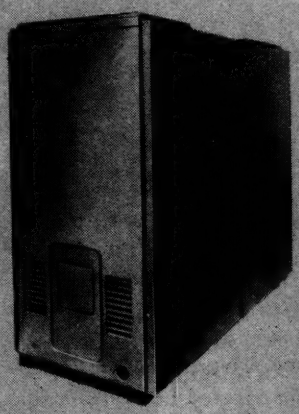
Name
Firm
Address
City

"Here's the ultimate in year 'round conditioning...with independent humidity control"

says S. H. Baldwin,

S. H. Baldwin and Company, Lubbock, Texas

"Recommending all-weather conditioning to a homeowner is like selling a man a Cadillac. While thousands will buy, all have to be sold on the *extra* values. That's where the Bryant All-Weather Conditioner fits into the picture! Not only does it control the temperature, but *closely* controls the *humidity*, too . . . a brand new development in residential air conditioning. With the Bryant it's even possible to *remove excess moisture* from the air *without lowering room temperature*. Completely automatic, the All-Weather Conditioner heats, humidifies, cleans and gently circulates the air when warmth is needed; also cools, dehumidifies (then reheats, if necessary) the air for summer comfort. Independent, automatic humidity control takes the Bryant out of the "me too" class of year 'round conditioning. Naturally, many other features have made Bryant tops in the field. If you want the *ultimate* in year 'round conditioning, get acquainted with the Bryant All-Weather Conditioner. Your Bryant distributor has the facts, or write Bryant Heater Division, Dept. 144, Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland, O.



BRYANT ALL-WEATHER CONDITIONER

Sizes 3- and 5-ton cooling capacity. Total heating input 150,000 BTU/Hr. in the smaller model, 200,000 in the larger size. Units available for electrical power from 208 to 230 volts, 1 or 3 phase 50 to 60 cycles. AGA approved and Underwriters' listed.

bryant® *best buy*

IN HEATING,

AIR CONDITIONING,

WATER HEATING

ALCO VALVES had something to do with this

ALCO VALVES help refrigeration systems operate at peak efficiency. They keep produce, meats and dairy foods "just right" for the chef's approval.

ALCO 402 TYPE – miniature, universal valve for display cases, deep freezers, milk coolers, blower coils. Pressure limiting for motor protection. Easy to install and service.

ALCO MULTI-OUTLET THERMO VALVES – assures equal distribution of refrigerant on multiple circuit systems. For all refrigerants and applications: ½ to 50 tons "Freon-12", 2 to 36 outlets.

ALCO "T" SERIES – easy to service on the line. Comes apart in three simple steps. External superheat adjustment. For all temperatures and all refrigerants: ½ to 50 tons "F-12".

ALCO SOLENOIDS – tight-seating; give accurate temperature control.

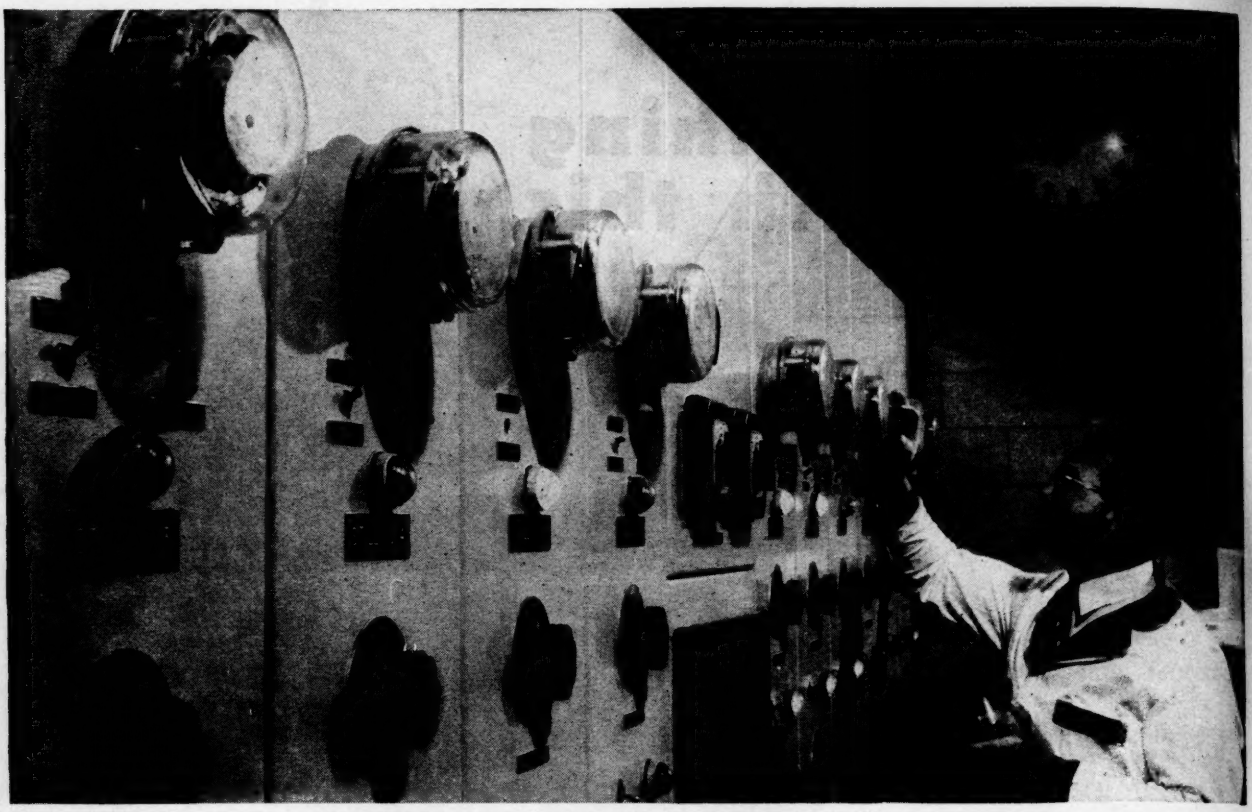
SEE YOUR ALCO WHOLESALER

ALCO VALVE CO.

859 KINGSLAND AVE. • ST. LOUIS 5, MO.

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

820B



WHETHER FOR DISTILLATION COLUMN CONTROL OR MILLING MACHINE LUBRICATION CYCLES, PROCESS TIMERS KEEP JOB-COSTS DOWN.

Reduce Repeating-process Costs with G-E Timers

Eliminate costly waste on those jobs which require precise measurement and control. You can—if you use the process timer shown above.

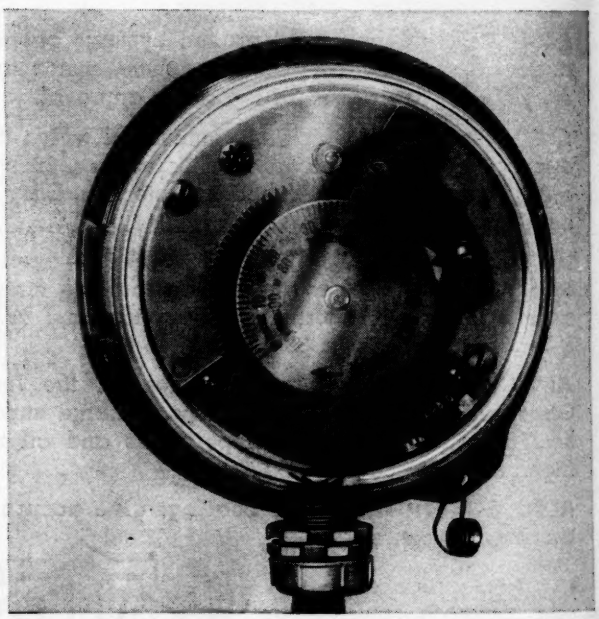
EASILY ADAPTABLE TSA-14 has uses which range from milling machine lubrication to laboratory set-ups. It saves time and money. A large eastern chemical manufacturer uses ten of these timers in one laboratory—increased efficiency and cost reduction is the result.

TSA-14 TIMER IS USED for economical control of on-off circuits where the percentage of ON time of the double-throw contact is adjustable. It is used on industrial air conditioning equipment, automatic machine tools, and other applications where on-off time demands accurate control.

BENEFITS OBTAINED by using the TSA-14 process timer include waste reduction, assurance of uniform operation, and reduced production costs, since workers are freed to handle other jobs.

MAINTENANCE COSTS are negligible. It can be installed outdoors, as well as indoors, for among its many features are a weather-proof die-cast base and glass cover. Installation and adjustment are easy. The timer gives accurate, synchronous-motor drive, provided by a Telechron® motor.

SEND FOR BULLETIN GEC-525, which describes the TSA-14 timer in detail. Address Section 603-129, General Electric Company, Schenectady 5, New York.



PROCESS TIMER APPLICATIONS range from industrial process control to sign flashing. Wide adaptability, easy installation and setting make this timer a natural for reducing job costs.

GENERAL ELECTRIC

American Blower – a time-honored name in air handling

American Blower Heating and Ventilating Unit. Complete range of sizes. Capacities from 1000 to 15,000 cfm and 45,000 to 976,000 BTU/hr.

That delightfully fresh, pleasant atmosphere which works wonders for employee morale, working and selling conditions, is assured when American Blower Heating and Ventilating Units are installed.

These dependable units, with slow-speed centrifugal fans, are available in a wide range of sizes for wall, horizontal, inverted and floor installation. Each fan housing is equipped with Aileron control. Humidifiers, face and by-pass dampers, filter boxes and mixing boxes are available.

Investigate these efficient Heating and Ventilating Units *now*. Call your nearest American Blower Branch Office for data.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

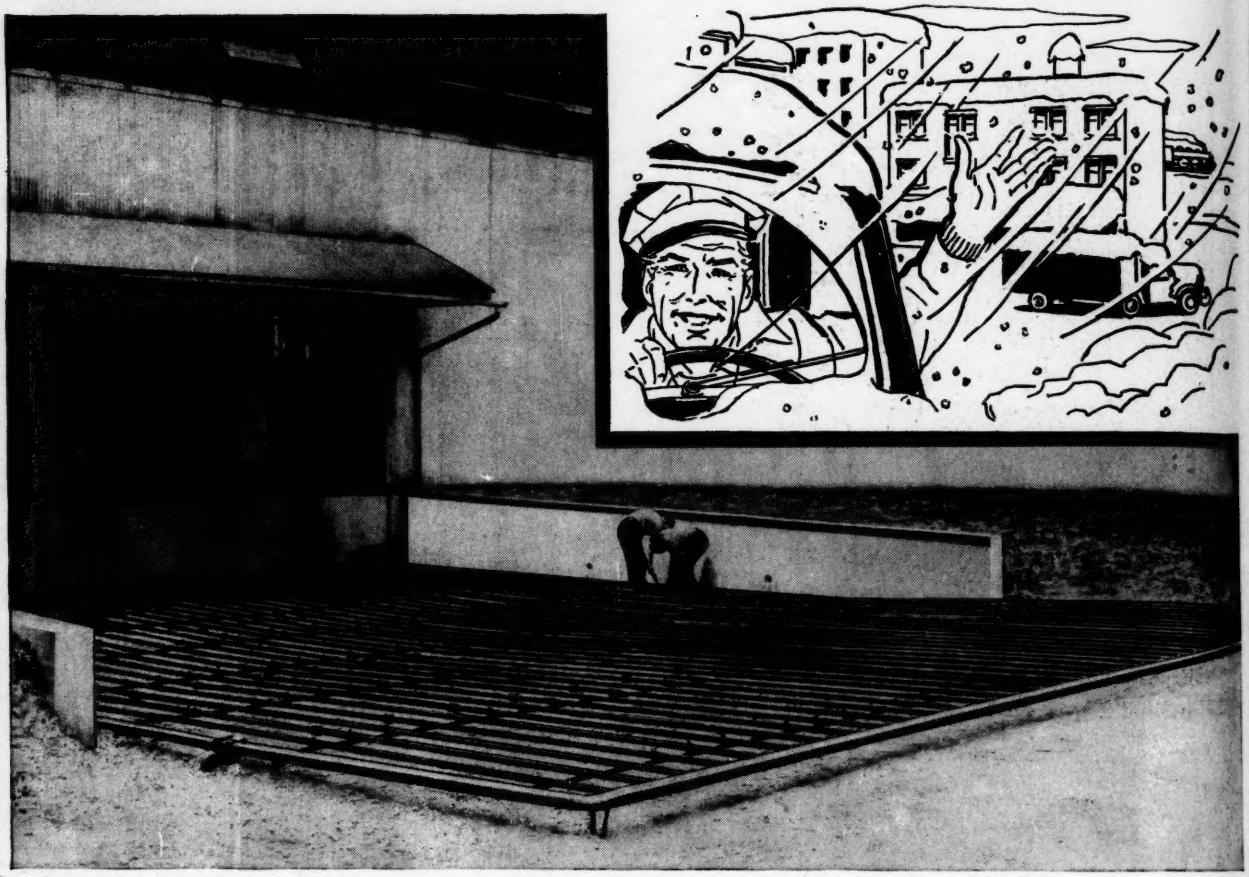
AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry

STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

"Just a Breeze" in any Snowstorm!



No stuck trucks at loading docks with steel pipe snow melting

All the precious time gained, high-balling the highway with urgently needed cargo, or making fast work of local deliveries, can be lost forever by a jam at an inclined or declined loading or receiving dock, caused by just a skim of ice or a mere half-inch of snow to say nothing of a heavy storm!

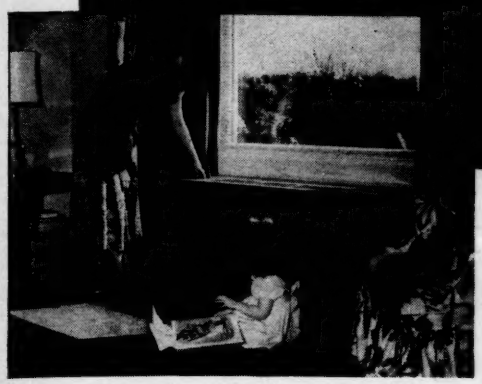
Yet for a comparatively minor investment, dock approaches and aprons can be kept snow and ice free all winter long. So, far-sighted managements are licking this weather problem at the docks with steel pipe snow melting systems . . . and the big wheelers roll in and out "in a breeze."

Snow melting and steel pipe go hand-in-hand. Economy in purchase and durability in service make it a natural for this application. Add the important factors of formability and weldability for panel fabrication and you have the reasons why steel pipe is first choice for snow melting systems—and why it's the most widely used pipe in the world!

Steel Pipe is First Choice

COMMITTEE ON STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 Fifth Avenue, New York 1, N.Y.

THE REMOTAIRE
by AMERICAN-Standard



Ideal for new construction or modernization of hotels, motels, office buildings, hospitals, schools, apartments, and residences. Permits individual weather control for each room.

● **THE REMOTAIRE** is designed for summer cooling and winter heating for multi-room installations. Individual control of each unit allows the occupant to choose the room temperature that suits him best without affecting adjoining spaces.

Chilled or heated water is supplied to the Remotaire through a simple piping system from a remotely located central water chiller and heating plant. Designed for location under windows, the Remotaire can be free standing or recessed into wall 4 inches.

The Remotaire is provided with an arrangement for introducing ventilation air through a wall aperture. However, ventilation air may be supplied by several other methods if desired.

Installation of the Remotaire is easy and simple. For descriptive literature on this new remote type room air conditioner, including dimensions and ratings, write for Form 298.

Design provides low cost installation . . . efficient performance . . . and minimum maintenance

1. . . . four standard control packages are available.

2. . . . coil is designed for either right or left hand connections and can be easily reversed in the field if necessary.

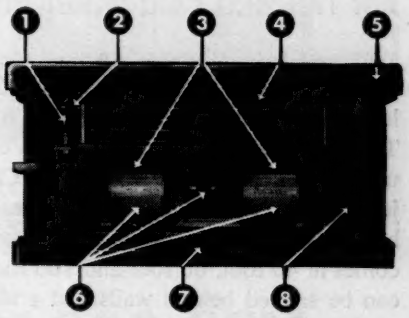
3. . . . exceptionally quiet with low speed fans and acoustically-treated air passages.

4. . . . coil shield over the top of the coil prevents foreign matter from falling into coil. Should liquid be spilled in air grille, the coil shield will safely carry liquid into drain so it will not injure unit or room floor nor interfere with operation of the Remotaire.

5. . . . rugged cabinet construction of sturdy, reinforced, furniture steel—plus a reinforced air grille—adds to permanence and long-lasting beauty of unit.

6. . . . fans and motor on single mounting plate permit easy removal if necessary.

7. . . . room ventilation can be adjusted —either manually or can be automatically operated—with the fresh air damper located in each unit.



8. . . . spacious end compartments with removable end panels provide ease of installation and allow more than 90° horizontal wrench swing.

American Radiator & Standard Sanitary Corporation, Dept. HV-72, Pittsburgh 30, Pa.

AMERICAN-Standard
HEATING-COOLING

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

There's no REAL substitute for

CHASE® COPPER WATER TUBE

For hot and cold water lines

Why risk a substitute when you know you just can't beat Chase Copper Water Tube for domestic hot and cold water lines! Chase Copper Water Tube will not clog with rust. For new construction use Chase Type L, hard temper, and Chase solder-joint fittings. Available in 20 foot straight lengths hard or soft temper. Type L, soft temper, also comes in 40 foot, 60 foot and 100 foot coils that can be snaked behind walls and under flooring.

For underground piping

Look at all the advantages in using Chase Type K Copper Water Tube soft temper, for underground piping! It is so ductile it can be bent around rocks and obstructions. Settling won't harm it as it moves with the earth. Chase Copper Water Tube comes in coils in lengths up to 100 feet. This means fewer fitting connections. All Chase Copper Water Tube is readily bent and cut.

Chase® BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

Albany†	Chicago	Denver†	Kansas City, Mo.	Newark	Pittsburgh	San Francisco
Atlanta	Cincinnati	Detroit	Los Angeles	New Orleans	Providence	Seattle
Baltimore	Cleveland	Houston†	Milwaukee	New York	Rochester†	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)

KENNARD Engineered

Heating and Ventilating Units

Air Volumes from 400 to 21,000 CFM

Kennard Heating and Ventilating Units are the answer to requirements of heating and filtering recirculated air, fresh air, a mixture of both, or for ventilation only. These ruggedly constructed and easily installed units, conventionally used for heating large spaces or as a central station unit to heat many small rooms, can also be utilized for a variety of special and process applications.

Wall - Floor - Ceiling Mountings

Pre-heat and Re-heat Coils - 1.1 to 32.5 sq. ft. face.

Moderate tip speeds and outlet velocities

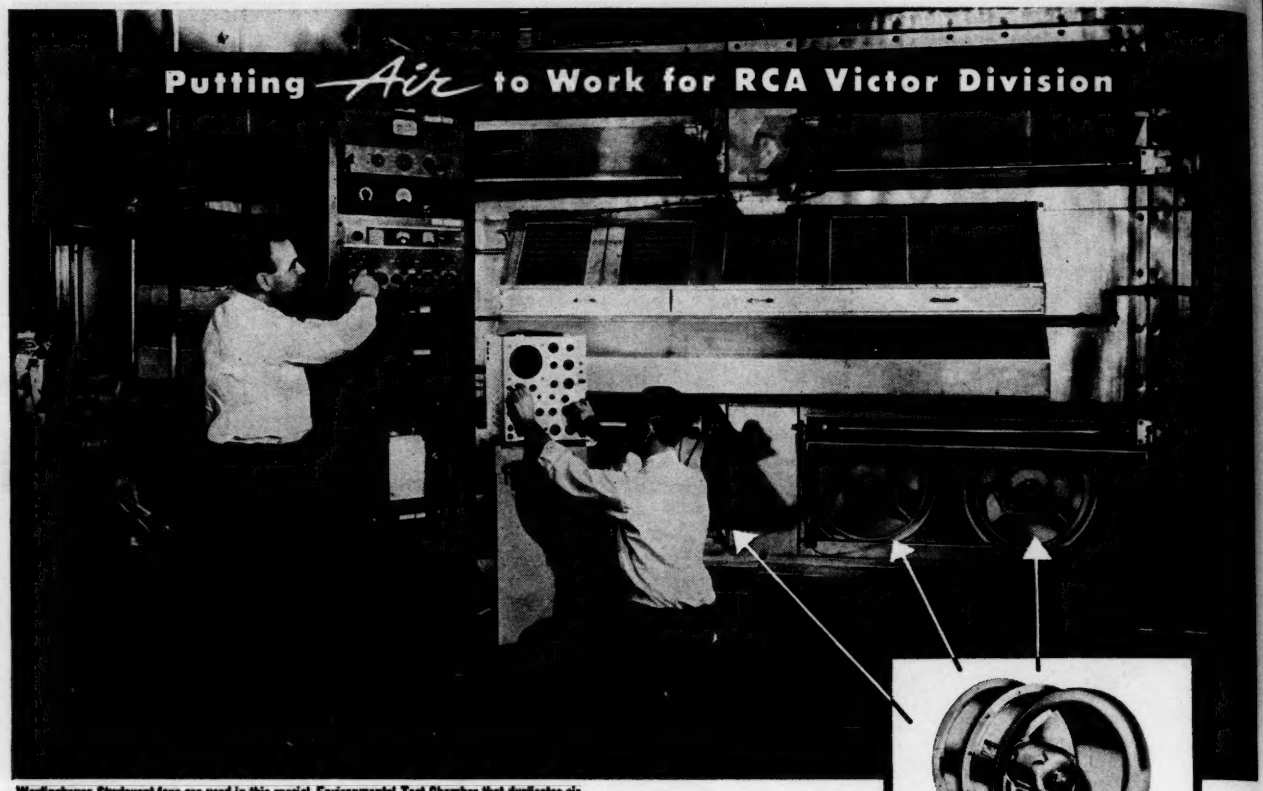
Optional Equipment

Mixing Box and Dampers • Face and By-pass Dampers • Throwaway, Cleanable or High Velocity Filters • Target, Grid or Pan Humidifiers.

Representatives in Principal Cities

Write for name of nearest representative and complete information on Air Conditioning Blower Units—Finned Coils—Evaporative Condensers—Cooling Towers—Sprayed Coil Dehumidifiers—Multi-Zone Air Conditioning Blower Units.

KENNARD CORPORATION • 1823 S. HANLEY ROAD ST. LOUIS 17, MO., U.S.A.



Westinghouse-Sturtevant fans are used in this special Environmental Test Chamber that duplicates air conditions from sea level to 20 miles up for testing RCA electronic equipment.

HOW DO ELECTRONIC DEVICES BEHAVE 70,000 FEET UP?

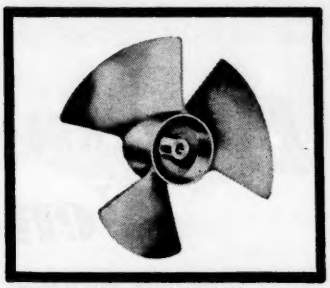
Lives depend on the answers found in this atmospheric testing chamber in type-test laboratories of RCA's Engineering Products Department. But the answers aren't easy to get. For the big problem is to duplicate as accurately as possible the thin, cold air of high altitudes.

The solution? Powerful Westinghouse-Sturtevant Axiflo Fans constantly circulate chilled air, force temperatures down as low as –85°F. Working against a partial vacuum, created to simulate low pressures encountered in the upper regions of the stratosphere, these fans keep temperatures uniform to within several degrees by providing a homogeneous mixture of air throughout the chamber.

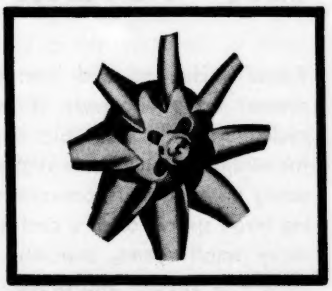
No matter how you want to *put air to work*—whether air handling, air conditioning or air cleaning—Westinghouse offers you a complete line of industry-proven equipment to fill your needs. For complete details, call your local Westinghouse-Sturtevant office. When you do, also ask for new General Catalog 600—a 60-page reference file for Putting Air To Work. Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Mass.

Test Chamber designed and installed by Tenney Engineering, Inc., Newark, N. J.

Axiflo Pressure Fans find wide use throughout industry because of adaptability to duct systems and for discharge against high winds.



3-Bladed Aluminum wheel is non-sparking, corrosion-resisting; handles large volumes.



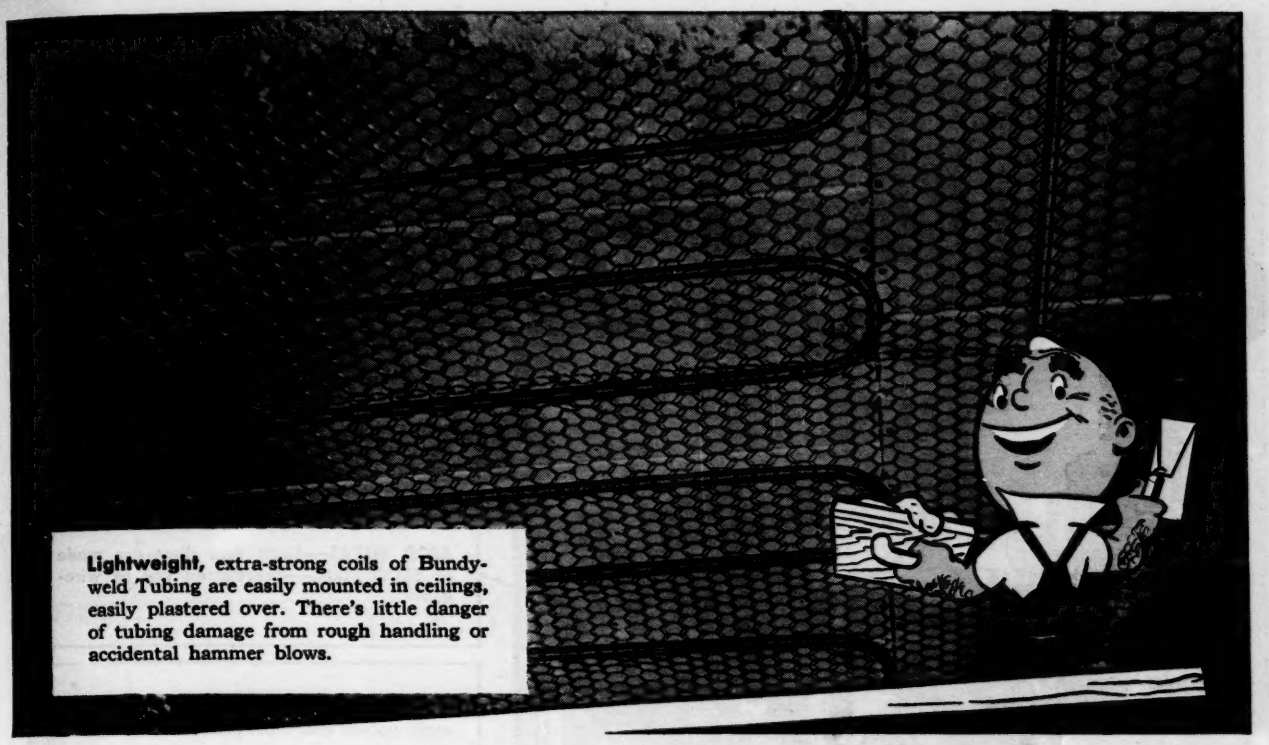
8-Bladed Steel Wheel is non-overloading, quiet and stable; ideal for high temperatures.

YOU CAN BE SURE...IF IT'S Westinghouse

J-80267

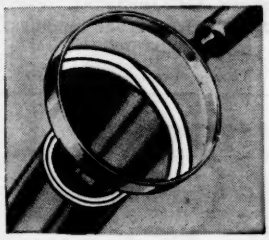
AIR HANDLING

TUNE IN ON HISTORY! Only Westinghouse brings you complete coverage of four-month political campaign over CBS television and radio.



Lightweight, extra-strong coils of Bundyweld Tubing are easily mounted in ceilings, easily plastered over. There's little danger of tubing damage from rough handling or accidental hammer blows.

Forge ahead of your competitors with Bundyweld ceiling radiant heating



Key to Low Cost

Bundyweld is the only tubing double-walled from a single strip, copper-brazed through 360° of wall contact. It's leakproof, thinner walled, yet stronger. It transmits heat quickly, has high bursting strength. It saves up to 50% on material costs and installation time.

Standard 20′ or 24′ lengths of Bundyweld are easily formed into coils in shop or on job site. Expanded ends (furnished when specified) are quickly soldered into leakproof union. Joined, lightweight coils are easily mounted onto ceiling, quickly plastered over.

To thousands of users, Bundyweld ceiling radiant heating has already proved a cleaner, more economical, more convenient way to heat.

They in turn are selling friends on the idea of walls without dirt streaks, of warmth that's always even, of air that's fresh as spring.

But the biggest boom is coming from Bundy ads in *American Home* and in *Better Homes & Gardens.* People who are planning to buy a home now or later are sending in an avalanche of coupons. They want to know more about Bundyweld ceiling radiant heating. They want to know the names of builders and plumbing and heating contractors using it. These people are *your* prospects!

Why not place your business squarely in the middle of this interest? Why not move in ahead of your competition? Send the coupon!

LIKE HAVING THE SUN IN YOUR CEILING

Bundyweld ceiling radiant heating

Radiant Heating Division
BUNDY TUBING COMPANY
Detroit 14, Michigan

Radiant Heating Division, Dept. HV-652
Bundy Tubing Company, Detroit 14, Michigan

☐ Send free 20-page nontechnical brochure explaining Bundyweld ceiling radiant heating.
☐ Send Bundy technical radiant heating pamphlet.

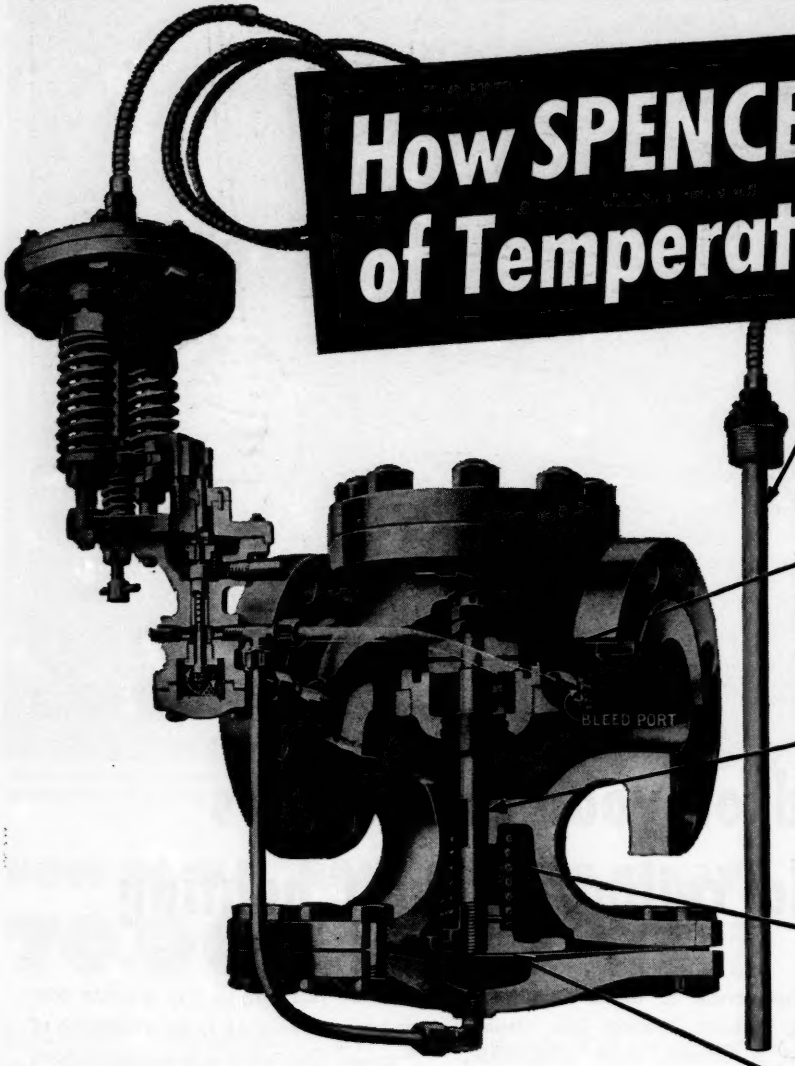
Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

How SPENCE Cuts Costs of Temperature Control



NEW THERMOSTAT ELEMENT—Improved to practically eliminate loss of filling. Rugged construction; cannot be injured by overheating.

SECO METAL—Seats and discs are made of SECO Metal—guaranteed not to wire-draw.

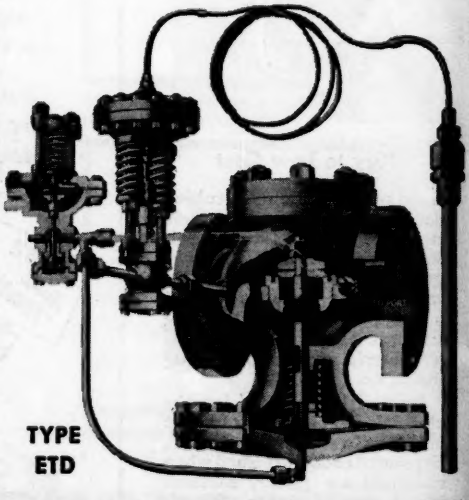
PACKLESS CONSTRUCTION — All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . eliminates much time-consuming maintenance.

PROTECTED SPRINGS — Springs in the Spence Regulator are out of the path of the steam or other fluid flowing through the valve.

LARGE BALANCED DIAPHRAGM— Spence metal diaphragms, under usual conditions, never require replacement.

Accurate Control for Both Storage and Instantaneous Heaters

Spence Temperature Regulators reduce the steam pressure and also accurately modulate the flow as required to control the temperature. No separate reducing valve is necessary • The Spence ET150 Regulator is recommended for heater pressures up to 50 psi. For higher pressures the Type ETD is available • For complete details on the entire Spence line of automatic regulating valves, strainers and desuperheaters, write for Bulletin 1200.



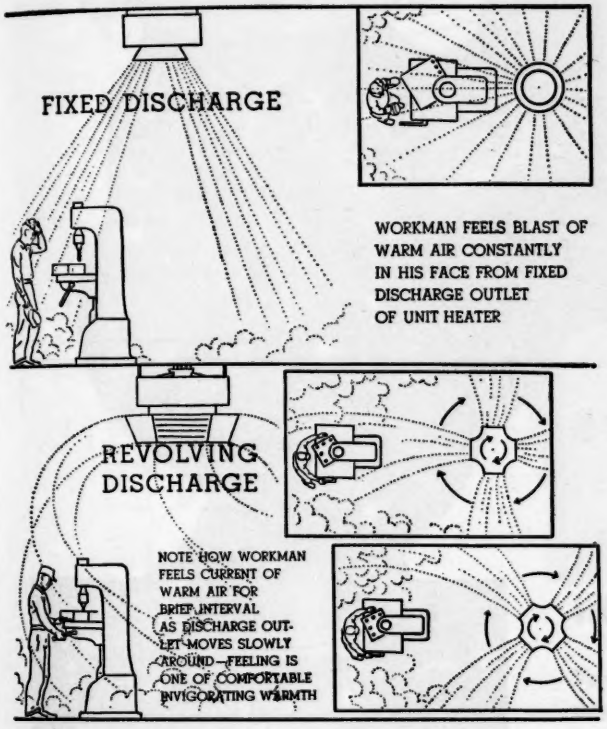
TYPE ETD

SE 111

Spence

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

What is the BIG difference between revolving and fixed unit heater discharge outlets? • • • •


FIXED DISCHARGE
WORKMAN FEELS BLAST OF WARM AIR CONSTANTLY IN HIS FACE FROM FIXED DISCHARGE OUTLET OF UNIT HEATER
REVOLVING DISCHARGE
NOTE HOW WORKMAN FEELS CURRENT OF WARM AIR FOR BRIEF INTERVAL AS DISCHARGE OUTLET MOVES SLOWLY AROUND—FEELING IS ONE OF COMFORTABLE INVIGORATING WARMTH

WING REVOLVING UNIT HEATERS are successfully solving the heating problems of thousands of industrial plants today because they assure a uniform, comfortable temperature throughout, with no hot blasts, no cold spots, no chilly corners. Instead of annoying hot blasts, the worker is conscious only of a pleasing sensation of fresh, live, invigorating warmth . . . and in summer, with the steam turned off, the revolving "heaters" become an equally efficient cooling system.

L. J. Wing Mfg. Co.
158 Vreeland Mills Road, Linden, N. J.
In Europe: Etab. WANSON, Haren-Nord, Brussels, Belgium
Factories: Linden, N. J. and Montreal, Canada

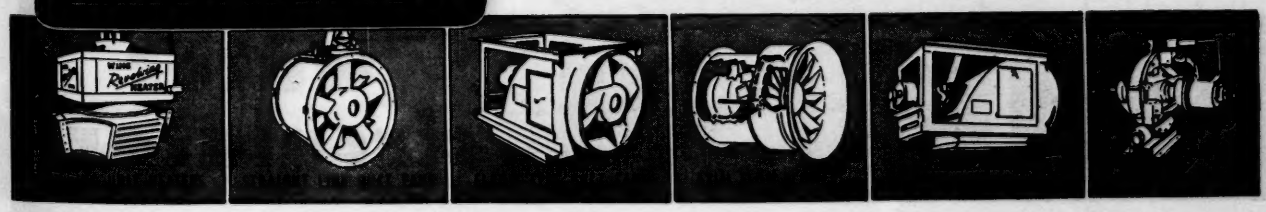
Wing
REVOLVING UNIT HEATERS

Write for a copy of Wing Bulletin HR-6, which discusses in detail the problems of industrial plant heating and in particular the value of revolving discharge.

L. J. Wing Mfg. Co.
158 Vreeland Mills Road, Linden, N. J.

Please send me a copy of your Bulletin HR-6, Wing Revolving Unit Heaters.

Name .....
Firm .....
Address .....
City ..... Zone .... State .....



for your dollar!

15 different Circulators

TWO TYPES • HORIZONTAL OR VERTICAL

EACH DESIGNED FOR ITS RATED CAPACITY

LARGER MOTORS • HEAVIER CONSTRUCTION

COMPARE capacities and motor horse power as well as size when you choose Circulators and you'll choose Thrush. Here is a complete line of horizontal or vertical Water Circulators to fit every heating job. They offer more for your circulator dollar because they're built better . . . even the smallest sizes are rugged in construction and have larger motors with greater actual output than other makes of equal rating. That means less trouble on the job . . . fewer service calls and greater customer satisfaction. Patented coupling eliminates vibration. Lubrication is sealed in. Ask your wholesaler about them or write Dept. D-7.

H. A. THRUSH & COMPANY • PERU, INDIANA

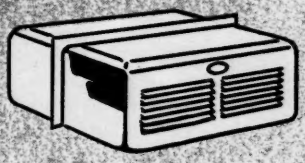
¾" • 1" • 1¼" • 1½"
1/6 HORSEPOWER

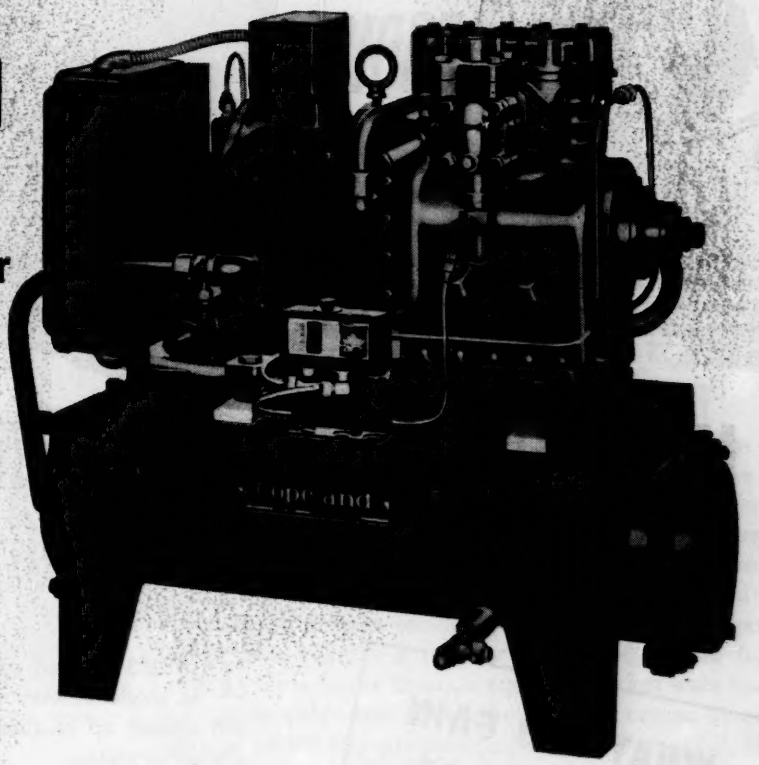
2" • 2½" • 3"
1/4 HORSEPOWER

THRUSH water circulators

COPELAMETIC

THE *Accessible* HERMETIC





condensing units and motor-compressors for all air conditioning requirements

- ☑ COMPACT
- ☑ ECONOMICAL
- ☑ DEPENDABLE
- ☑ RUGGED
- ☑ QUIET

Copelametic is as modern as air conditioning itself. Its advanced design neatly combines the best qualities of open-type and welded-in units into one compact package. No belts, no seals, no manual oiling. It is fully accessible when the rare occasion arises.

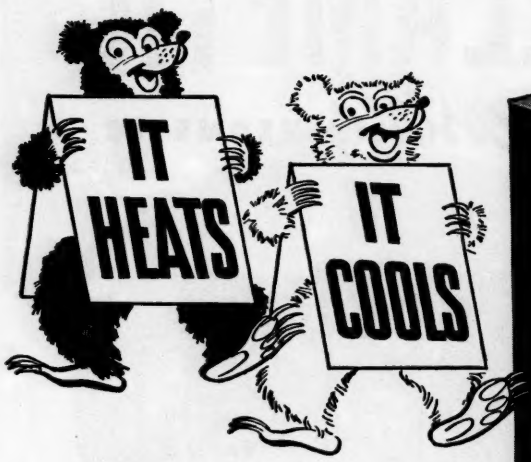
And the Copelametic is just one star performer in our dependable line. There is a rugged Copeland unit for every application in refrigeration and air conditioning. Sizes through 7½ H.P. Write today for complete data.

Copeland

DEPENDABLE *Electric* REFRIGERATION

COPELAND REFRIGERATION CORPORATION, SIDNEY, OHIO

Don't let old-fashioned radiators stymie modernization plans



IDEAL FOR STORES, SHOWROOMS, SCHOOLS, BANKS, HOTELS, HOSPITALS, THEATERS, CHURCHES, OFFICES, VESTIBULES AND OTHER COMMERCIAL AND PUBLIC BUILDING AREAS

Type C with optional plenum base for floor mounting

Modine Cabinet Units simplify remodeling... save space...permit addition of cooling

WHAT YOU GAIN

when you replace old-fashioned radiators with Modine Cabinet Units

SPACE	Cabinet Units occupy only a portion of space taken by radiators.
CONCEALMENT	Cabinet Units can be built-in or installed outside of rooms served.
COOLING	You can have both heating and cooling in a single unit.
VENTILATION	Attachment of optional plenum-damper base permits fresh air introduction.
AIR CIRCULATION	Quiet blower fans provide positive air distribution.
APPEARANCE	Attractively styled cabinets blend with modern decor.

THERE'S no need to accommodate unsightly, existing radiators in modernization work. One attractive Modine Cabinet Unit can replace up to three or more radiators... frequently with no change in piping.

Mounted on the floor, wall or ceiling, Cabinet Units take little space. When installed with ducts they can be completely concealed above a false ceiling or behind a partition.

Where desired, chilled cooling and hot water heating can be provided with a single unit for year 'round comfort. Other models for steam or hot water heating only. Fresh air introduction is possible through use of an optional plenum base.

Not as elaborate or expensive as unit ventilators or air conditioners, Modine Cabinet Units are economical to use. What's more, the scrap value of the radiators they replace defrays part of their cost. (For example, a 280 lb. Modine Cabinet Unit replaces 3200 lbs. of cast iron radiation.) Available in five sizes from 120 to 640 Edr.

For complete information write for free illustrated Bulletin 550. Modine Manufacturing Company, 1511 De Koven Ave., Racine, Wis.

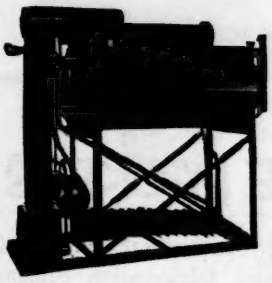
C-1149

WRITE FOR FREE BULLETIN 550

Modine
CABINET UNITS
FOR HEATING & COOLING

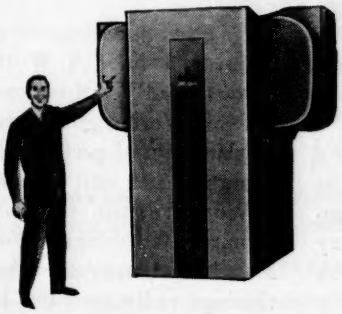
"I like to sell Servel Air Conditioning because it practically services itself."

Only Servel Gives All These Sales-Winning Extras!



25-Ton Water Chiller

Commercial Unit where no ducts are needed



All-Year Air Conditioner

Here's the one Air Conditioning that helps sell itself and helps keep itself *sold!* No other refrigeration unit offers all the Servel features . . . no other unit offers such amazing, trouble-free service. This is the famous equipment that has no compressor . . . no moving parts, no vibration, no noise . . . for minimum maintenance, minimum service on your part. (Refrigerating unit carries a factory guarantee of five full years.) This is the famous equipment that uses *heat* to create *cold*—can be connected to present steam source under any pressure; operates on gas, oil, LP gas, even waste heat! You can select the most economical energy source to keep operating costs low. Refrigerant is water in a pressure-free unit for complete safety. Get the facts today—there is a full range of Servel Air Conditioning Equipment so you can sell every prospect from the residential and small commercial buyer to the large commercial, industrial and military type installation.

SELL SERVEL . . . the air conditioning that offers low operating cost, guaranteed dependability in residential, commercial or industrial installations.

Servel

AIR CONDITIONING

Made by the makers of the famous Servel Refrigerator

SERVEL, INC. • Evansville 20, Indiana

Get the facts and you'll sell Servel! Write for complete information today.

Servel, Inc., Dept. HV-7, Evansville 20, Indiana

Gentlemen: I'm interested in the money-making advantages of selling Servel Air Conditioning Equipment. Send me full details on ☐ Industrial ☐ Commercial Units.

Name.....

Firm.....

Address.....

City.....*Zone*....*State*.....

THE PICK OF THE PACKERS

Out where the West *ends* . . . many of the great meat packers use Worthington *refrigeration* machinery.

And all over the country, many famous *restaurants*—Toffenetti's in Times Square, Silver Fox Restaurant in Washington, The Century Room, Dallas—use Worthington *air conditioning machinery.*

When you specify "Worthington", you specify the air conditioning and refrigeration equipment that's used by the "first" names in every field.

No other manufacturer makes *so complete* a line. A Worthington system is all Worthington-*made*—not just Worthington-assembled—assuring you of perfectly balanced operation and unit responsibility.

Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, New Jersey.

America's Leader's... in Many Businesses... Select

WORTHINGTON

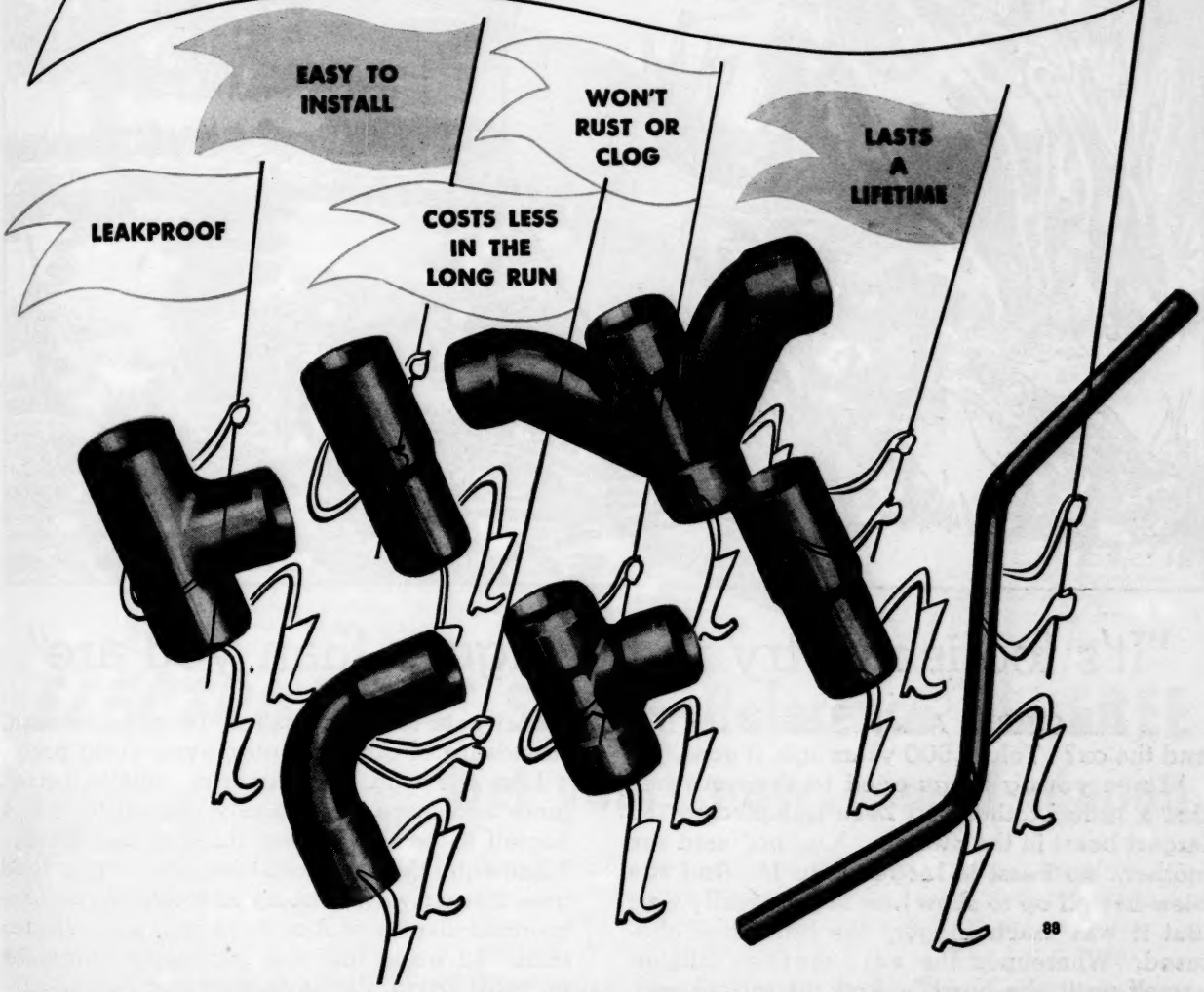
A-2.11

AIR CONDITIONING AND REFRIGERATION

The Most Complete Line... Always the Correct Recommendation

You can use copper for plumbing . . . so why not use the best . . .

Streamline® COPPER TUBE AND SOLDER TYPE FITTINGS



Yes, you *can* use copper for both domestic hot and cold water lines and underground service lines. So, when you give your customers copper, install the best . . . STREAMLINE copper tube and solder type fittings.

Here's why it pays to use STREAMLINE copper tube and solder type fittings:

- They save installation time and money because both tube and fittings are precision machined for perfect fit.
- Uniform solder cup depths simplify roughing-in.
- Lighter and easier to handle . . . tube can be readily snaked around obstructions.
- It's permanent—can't rust, won't clog and lasts more than a lifetime.

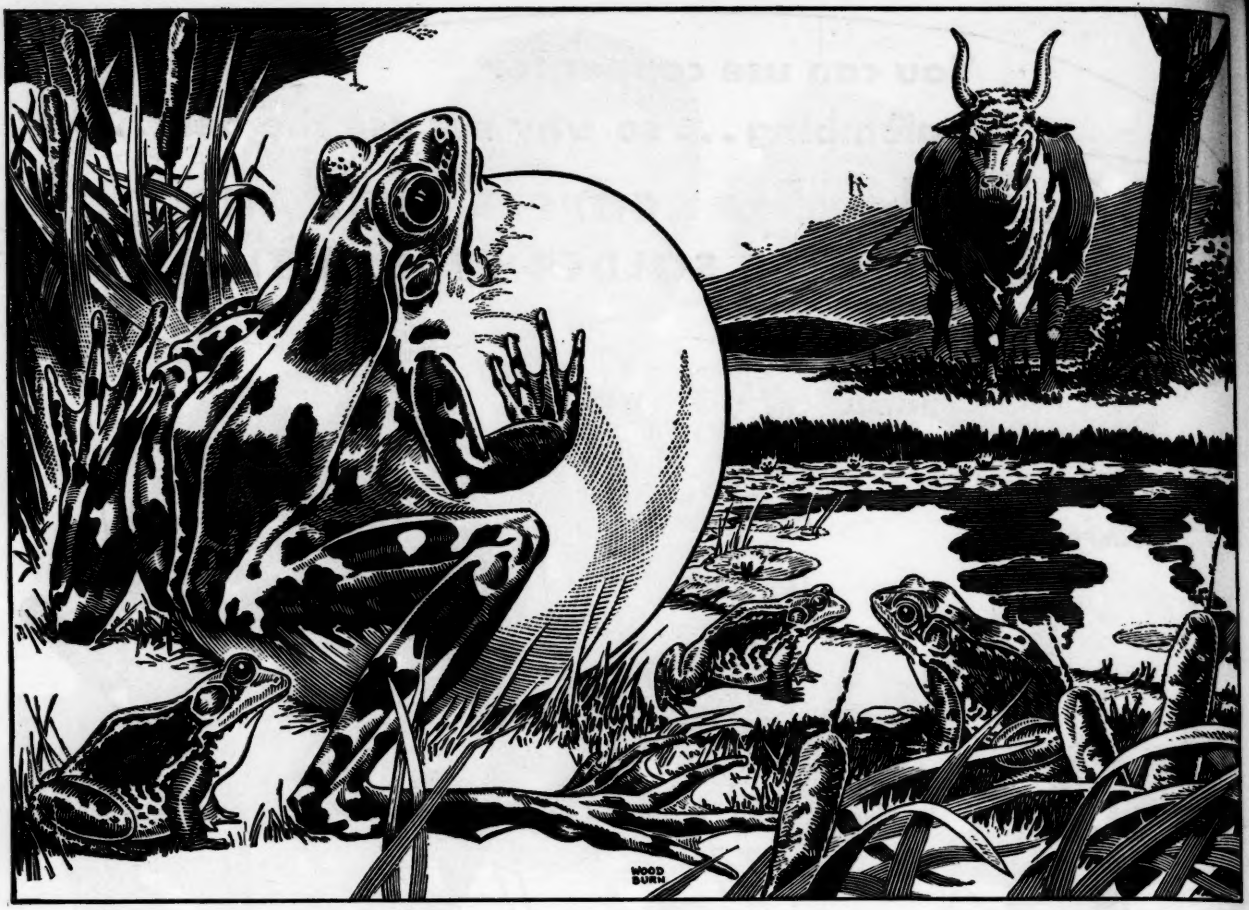
Architects, Plumbers, Builders and Home-owners all agree on the permanence, the economy and the common sense of an all-copper plumbing system.

IT PAYS TO USE COPPER FOR PLUMBING AND HEATING . . . WHY NOT USE THE BEST—STREAMLINE COPPER TUBE AND SOLDER TYPE FITTINGS.

STREAMLINE copper tube is available in 20 ft. straight lengths and 60 ft. coils. See your jobber for further information or write today for catalog S-352 and details concerning present government regulations on the use of copper.

MUELLER BRASS CO. STREAMLINE PRODUCTS

MUELLER BRASS CO. PORT HURON 2, MICHIGAN



"It's foolish to try to be bigger than you are"

REMEMBER Aesop's fable of the frog and the ox? Told 2,500 years ago, it goes:

"Three young frogs cried to their mother that a little brother had been trampled by the largest beast in the swamp. 'Oh, no,' said the mother, 'no beast is larger than I.' And she blew herself up to show how big she really was. 'But it was much bigger,' the little ones chorused. Whereupon the vain mother inflated herself until she burst." And the moral was, "It's foolish to try to be bigger than you are."

Aside from the wisdom of the fable for each of us individually, there is solemn warning for us as a nation. Some among us seem to believe that with an unlimited supply of taxpayers' dollars America can buy anything--ease and security at home, acceptance of our ideas abroad, friendship of other peoples, even world peace.

Like the vain frog, America inflates herself more and more dangerously, trying to stretch herself to be the biggest thing in the swamp. Meanwhile the enormous beast that is the world goes its own way, scarcely affected by the vain-glorious display of America's inflation. It's the same old world that was indifferent before the pomp of Egypt, Persia, Greece and Rome.

How will our present "puffing" end? Isn't it obvious that continued inflation can bring disaster? Only by a realistic policy of living within our means--not trying to be bigger than we are--can America avoid the catastrophe of Aesop's foolish frog.

YOUR SCRAP IS NEEDED — YOUNGSTOWN

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

YOU'LL make more money ...and keep making it!

Complete Electromode Electric Heating sales and reference file.

Illustrations of all heaters, domestic, industrial, farm and explosion-proof models.

Features of all units, cut-away and x-ray photo views.

Installation pictures and Instructions for installing heaters.

Formulas for selecting sizes for specific applications.

Specifications pages include: size, styles, weights, capacities, models, prices.

Guide for Calculating Electric Space Heating.

It's standard file and brief-case size, rugged folder stock, big tab for identification, prepared in sections by types of heaters, 2 colors—grey and red. Size: 8¾" x 11½".

ELECTROMODE Sales—Reference File FREE

Get yours now...mail coupon

You'll make money . . . and keep making it . . . when you use Electromode's electric heating sales and reference folder. Full of down-to-earth facts, illustrations and little reading. A copy is waiting for you . . . send for it today.

Electromode Electric Heaters are made in models to heat small or large areas. Capacities from 1320 to 45,000 watts (4507 to 153,675 BTU). Easy to install, have built-in automatic thermostats, safety-switch and cast-aluminum heating element. Approved by Underwriters' Laboratories.

DEPT. HV-72

ELECTROMODE CORPORATION 45 Crouch St., Rochester 3, N.Y.

Please send us the new FREE Electromode Sales and Reference File.
We are particularly interested in . . .

☐ Home Heating ☐ Farm Heating
☐ Commercial Heating ☐ Industrial Heating
☐ Explosion-Proof Heaters

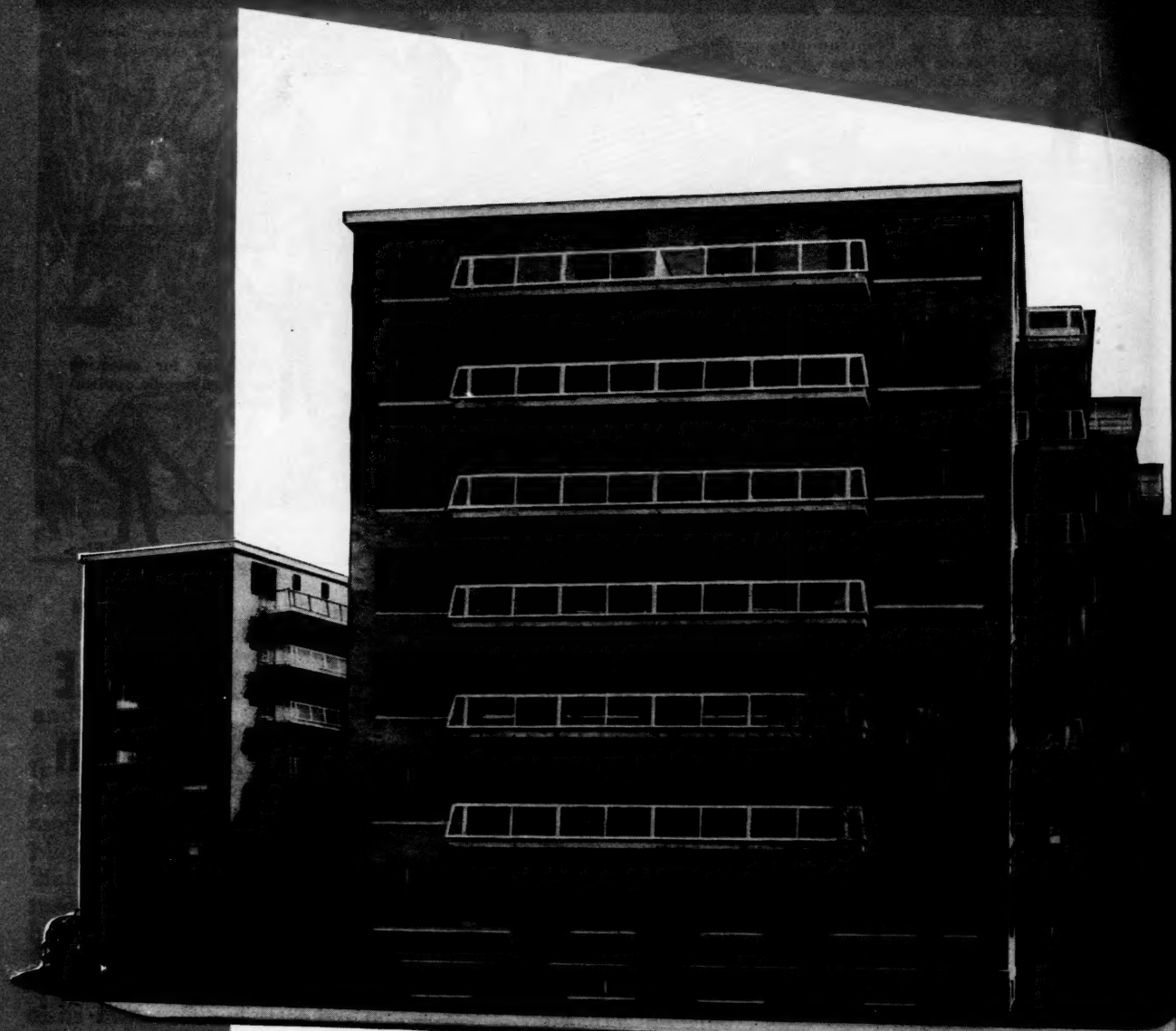
Co. Name _____

By _____ *Title* _____

City _____ *Zone* _____ *State* _____

fedders

A GREAT NAME IN COMFORT



RIVER HOUSE APARTMENTS

145 Pinckney Street, Boston, Mass.

Architect: E. T. Steffian

General Contractor: Industrial Engineering Company

Plumbing and Heating Contractor: C. H. Cronin, Inc.

FEDDERS-QUIGAN CORPORATION

...king warm friends ... New Boston apartments

✳ Hundreds of Fedders Convector-Radiators are contributing to the comfort and appearance of Boston's new River House Apartments.

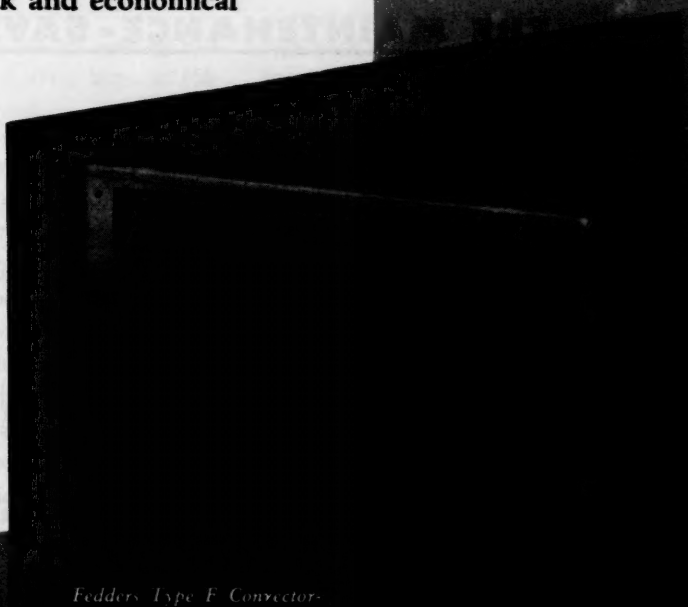
They are in perfect taste with handsome decorative schemes and furniture arrangements.

Architects, interior decorators and contractors are turning to Fedders Convector-Radiators across the nation for uniform floor-to-ceiling temperatures, quick response to modern controls, fuel economy and handsome appearance.

Fedders Convector-Radiators meet standard architectural and roughing-in dimensions . . . they are light in weight . . . compact in size . . . easy to stock and economical to deliver and install.

WRITE FOR CATALOG

The ratings of Fedders Convector-Radiators are in conformance with Commercial Standards CS140-47, as developed cooperatively by the trade and the National Bureau of Standards, U. S. Department of Commerce, and the said ratings have been approved by the Convector Rating Committee.



Fedders Type F Convector-Radiator, one of Fedders complete line for residential, commercial and institutional use.

YOU PAY NOTHING EXTRA FOR Amocel

...THE MAINTENANCE-SAVING PIPE INSULATION

Amocel for commercial uses—like famous Unarco higher-temperature Unibestos — is made from strong, resilient Amosite asbestos fiber. Designed for temperatures up to 600° F., it's a premium product in every way—clean appearance, long life, high efficiency—and it's easy to fit so you save from the first with this better insulation. Made in standard 1½", and 2" thicknesses for pipe sizes from ½" to 12" in half-rounds with jacket and metal bands. Your Unarco Distributor has Amocel. Call him or write for literature.

- UNHARMED BY MOISTURE, STEAM, OR FUMES
- LIGHT, STRONG—WITHSTANDS IMPACT AND VIBRATION
- MAY BE REMOVED AND REUSED REPEATEDLY WITHOUT DAMAGE OR LOSS OF EFFICIENCY

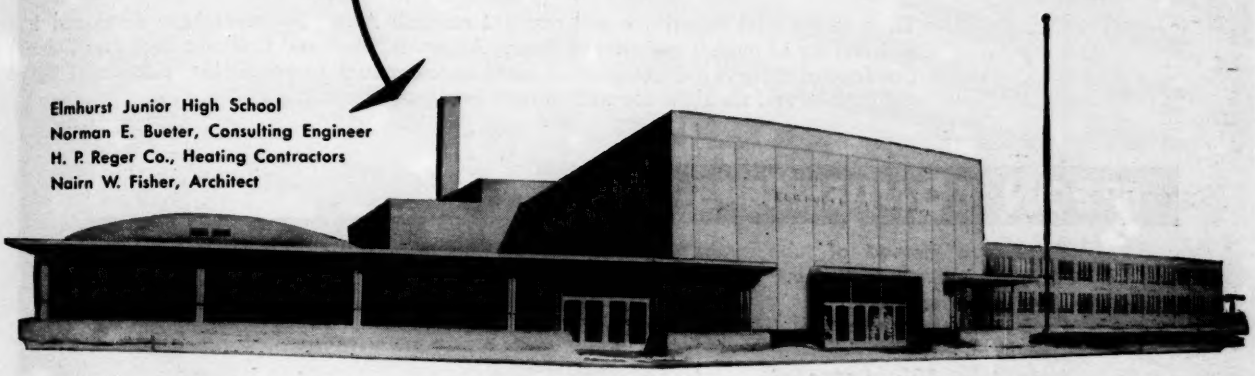
UNARCO

UNION ASBESTOS & RUBBER COMPANY

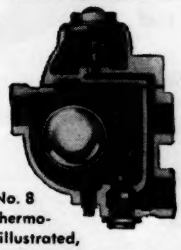
DEPT. B-7, 332 SOUTH MICHIGAN AVENUE • CHICAGO 4, ILLINOIS

What equipment but MARSH ...for a model school building like this?

Elmhurst Junior High School
Norman E. Bueter, Consulting Engineer
H. P. Reger Co., Heating Contractors
Nairn W. Fisher, Architect



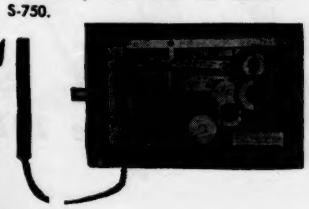
Many of these Marsh Packless Radiator Valves were used in the elaborate heating system of the Elmhurst Junior High, and a large number of thermostatic traps were used in connection with radiators and coils.



The Marsh No. 8 float and thermostatic trap, illustrated, is typical of many traps of this kind used in the Elmhurst school.

BIG SAVINGS WITH MARSH—TRITROL—heat regulation in step with the weather

By controlling inside heat in accordance with outside temperature, Marsh Tritrol gives ideal comfort at minimum cost. Installation is simple. Cost remarkably low. Ask for Bulletin S-750.



A lucky throng of boys and girls have just begun classes in the newly completed Junior High School at Elmhurst, Ill., a suburb of Chicago. One of the finest junior high schools ever built, the expansive structure houses a large gymnasium, a totally separate auditorium seating 900, a large, pleasant cafeteria, spacious well-equipped classrooms—facilities far beyond those of the old-time schools their dads and mothers knew as full fledged high schools.

In the rapid advance of school buildings during recent years, no phase has seen greater improvement than heating and air conditioning, and this model school is a particularly good example of this. No expense has been spared in any detail of the vacuum system to make it functionally and permanently effective. So it is significant that Marsh Traps and Valves were chosen for the vital job of keeping heating coils, mains and risers free from air and condensate throughout the entire heating system.

The use of Marsh equipment here is just one more example of advanced heating systems in outstanding buildings all over America in which Marsh heating equipment has been the first choice of foremost consulting engineers, heating contractors and architects. Use Marsh traps, valves, vents, and controls on that next job and you will know why Marsh has been so often accorded top preference for uncompromising quality, for consistent performance, for downright *value*.

Ask for new Catalog 76-H covering Marsh packless valves, radiator traps, float and thermostatic traps, inverted bucket traps, float traps, return traps, air traps, air vents and boiler gauges.

MARSH HEATING EQUIPMENT CO.

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MARSH *Heating Specialties*

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ACME CONDENSERS

and you meet every sales requirement

Through practical experience and constant research Acme Engineers have developed a wide variety of models and sizes of Freon, Ammonia, Shell and Coil and Shell and Tube Condensers. The Acme Condenser Line is varied enough to permit the selection of the right model and the right size unit to meet *every* requirement.

FREON CONDENSERS

- Exclusive method of tube support eliminates noise.
- Easy to clean.
- Leak proof joints.
- Combination Heads.
- More than 120 different sizes.
- A.S.M.E. Certification.

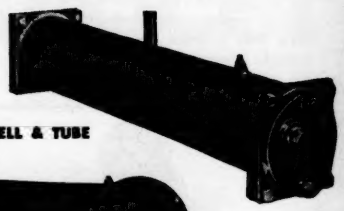
MODEL SRF

Shell & Coil and Shell & Tube CONDENSERS

Shell & Coil
Drainable Coils
Compact
Inexpensive

Shell & Tube
Cleanable tubes
Inexpensive
Compact
Dual Pass (J300 & larger)

SHELL & COIL



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AMMONIA CONDENSERS

Exclusive Locknut Construction Available
Rolled-in or Welded Tubes
A.S.M.E. Construction and Certification
Locknut Assembly for Easy Replacement
Custom Built

AMMONIA

These are only a few of the features and advantages that have made ACME Condensers the choice of the heavy refrigeration Industry for quality, design and lasting performance. Write for catalog on equipment you require.

ACME ALSO MANUFACTURES:

Dry-Ex* Water Coolers • Hi-Peak* Water Coolers • Flow-Cold* Liquid Chillers • Fin Coils • Cooling Towers • Oil Separators • Liquid Receivers • Heat Exchangers • Bio-Cold* Industrial Unit Coolers • Flow-Cold Refrigeration Units • Convectors

* Trade Mark

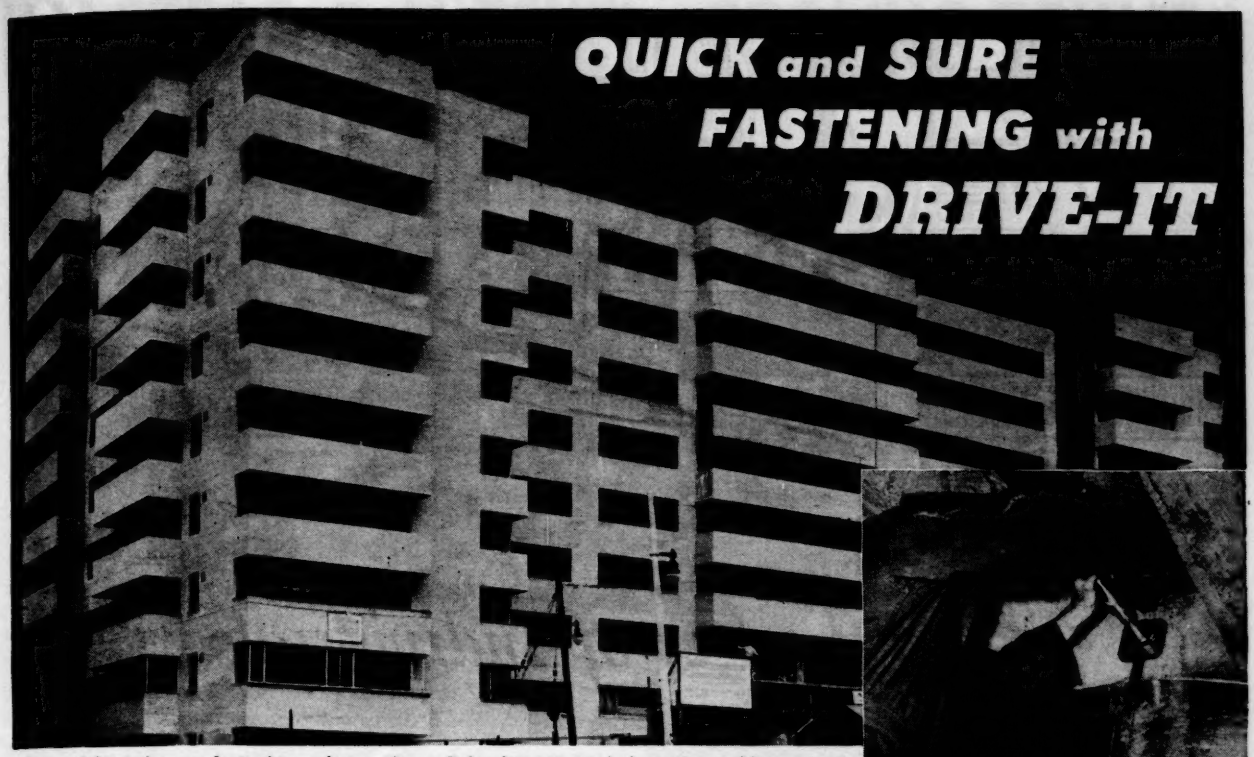
ACME INDUSTRIES, INC.

Dept. HV
Jackson, Michigan

ACME PRODUCTS

continuously serving the refrigeration industry since 1919

QUICK and SURE FASTENING with DRIVE-IT



For quick and sure fastenings plus savings, Drive-It was used throughout this modern apartment house in Washington, D. C. Fastening ventilating ducts, heating units, and plumbing to concrete and steel—these and many other uses save money, time and effort.

split-second fastening to concrete steel

Drive-It uses a small powder load to drive hardened steel pins into concrete or steel. No power lines! No drilling!

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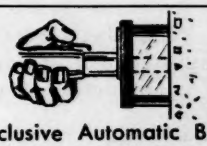
DRIVE-IT is the only powder-actuated tool approved by Underwriters' Laboratory.

DRIVE-IT cannot be discharged accidentally due to the push and turn sequence. This, plus the large safety pad makes *DRIVE-IT* triple safe.

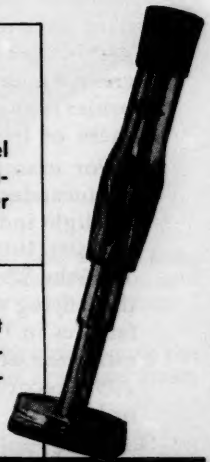


Exclusive Automatic Barrel Extension for fastenings inside junction boxes or other recesses.

DRIVE-IT is the only powder-actuated tool which requires but one standard power load regardless of penetration desired.

Exclusive Swivel Safety Pad easily rotated for getting into close quarter work.

Drive-It "300", lowest cost fastening tool. Low original cost and low operating cost.



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☐ Please send FREE catalogue and literature.
☐ I want a FREE demonstration of *DRIVE-IT*.

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"...On the feet of Individuals."

Society advances on the feet of individuals. We Americans live under the highest standard ever achieved because we believe in and are permitted currently to practice three of the cardinal principles of progress—Invention, Research and COMPETITION.

Nineteen basic inventions influence our pattern of life today. Each one was created to satisfy a fundamental need for improvement—a modern means of competing as against outmoded procedure. Each one, such as the electric light, the telegraph, the amplifying tube, the induction motor, created a new industry in which numerous companies strove in free competition for the maximum share of business.

For example, since Thomas Edison invented the incandescent filament lamp in 1880, the electric light industry has grown to an annual volume of $501,500,000 in light bulbs alone; in May, 1906 the Wright Brothers received the patent for their flying machine; the value of aviation manufactures in 1951 in the United States alone was estimated at $3,350,000,000 and in February, 1952, records show a $10½ billion backlog of orders.

More rapid still is the growth of the radio-television industry which today produces some $230 million worth of home radio sets and $1,570,800,000 in television sets. In every case, employment and sales volume grew enormously and the public enjoyed huge personal benefits.

Side by side with Invention came Research, exemplified by the competition of intelligent men questing for new materials, new methods, new processes, new scientific truths. Current advertisements tell of hundred-year tests to assure better materials for the future, technology that produces metals to withstand almost inconceivable heat, machines calculating 20,000 times faster than the mind of man, medicines that cure "incurable" diseases, food processes that cook, sterilize and pack hundreds of cans a minute. And in every case, the public enjoys huge personal benefits.

This is what James A. Decker undoubtedly had in mind when he wrote the line,"Society advances on the feet of individuals." These "individuals" are you and I, all our countrymen, benefiting every day from Invention, Research—and from COMPETITION.

Developing inventions, marketing products, and pursuing scientific research require substantial investments. A grave danger to their future now looms. In 1951, corporation net profits suffered a loss of 21% over the previous year. The reason—taxes too high, government controls and policies that interfere too greatly with private industry. If this continues, financial resources will dwindle, competition will be stifled.

Without free competition, American progress stops. No country can long exist when its government calls all the shots. We need competition to assure progress for people.

★ ★ ★

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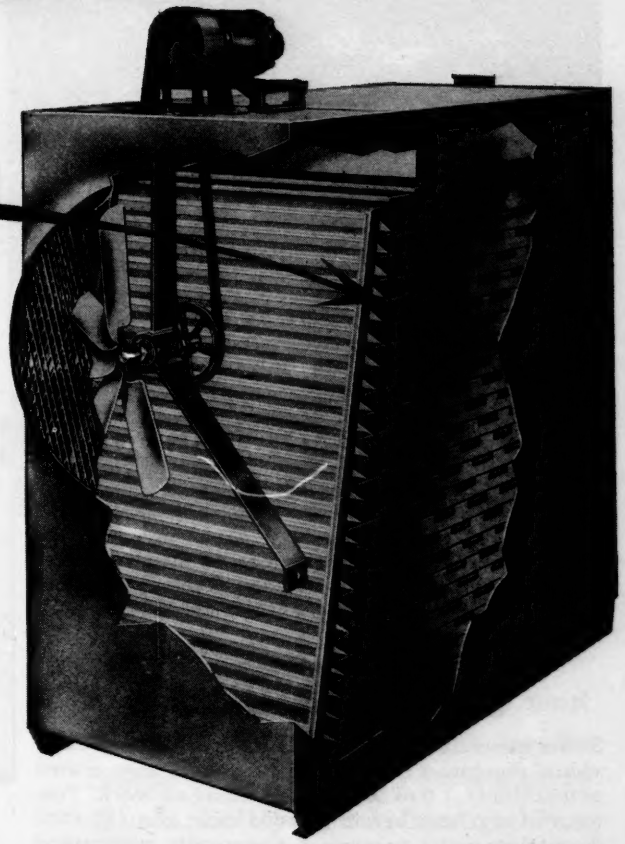
THE COMPETITIVE SYSTEM DELIVERS THE MOST TO THE GREATEST NUMBER OF PEOPLE

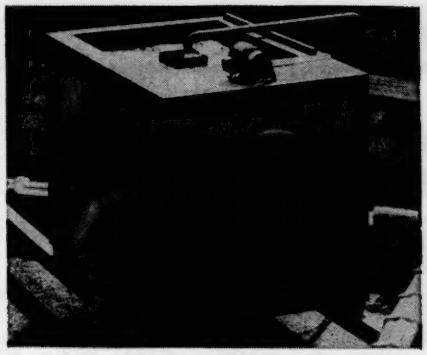
HALSTEAD & MITCHELL COOLING TOWERS

20-Year Guarantee!

On the Wetted Deck Surface of Koppers Pressure-Treated Wood



Here's the industry's greatest cooling tower value . . . "built like a battleship" for 20 years of foolproof performance. Halstead & Mitchell's pioneering in exclusive use of Koppers pressure-treated wood in the wetted deck surface makes possible the unprecedented 20-year guarantee against rotting, and provides the industry's most effective deterrent against fungi growth. Economical, lastworthy . . . the special H & M design for water distribution eliminates, thru the use of an efficient gravity-type distributing pan, extra pumping head required on spray type towers, also cuts down windage losses due to atomizing of water. The complete assembly is with Everdur bolts . . . disassembly is easy even after years of service. Easily accessible for cleaning through inlet on back of towers in all sizes.



MORE EFFICIENT IN ANY INSTALLATION

H&M # CT-4000 Induced-Draft Cooling Tower supplying the condensing water for 20 HP and 10 HP water-cooled condensing units in 3-story jewelry storeroom air conditioning. Note open-type distributing pan. This installation also has remote water basin in basement for year-round operation.

5 TONS to 50 TONS

A cooling tower for all applications, from 5 to 50-ton capacities—made by Halstead & Mitchell, one of the world's largest manufacturers of water-cooled Cleanable Condensers.

AT LEADING WHOLESALERS EVERYWHERE

Write for descriptive bulletin and information on engineering helps.

HOUSING—10 gage (1/8"+) sheet-steel case with 3 coats Bitumastic lining. Electrically welded cabinet. All bolts used are Everdur for ease of disassembly after years of service.

WATER DISTRIBUTION—Gravity type distributing pan eliminates extra pumping head, cuts down windage losses, due to atomizing water.

FAN AND DRIVE—Quiet-operating stainless steel 8-bladed fan, stainless steel shaft, chrome-dipped rust-proofed pulleys. Cast iron bearing supports. Adjustable belt tension.

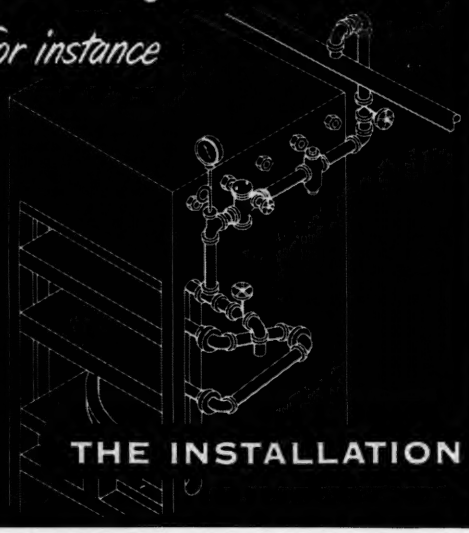
HM Halstead & Mitchell

OFFICES: BESSEMER BUILDING • PITTSBURGH 22, PA.

Will Your Pressure Regulators Last 25 Years?

...on Molding Press Service

for instance



THE INSTALLATION

Crane Brass Pressure Regulators on steam lines to rubber molding presses; Dryden Rubber Division, Sheller Mfg. Corp., Chicago. 225 units in service.

VALVE SERVICE RATINGS

FEATURES: Equally good on steam or air

SUITABILITY: Steady outlet pressure - No drift

MAINTENANCE COST: Routine servicing only

SERVICE LIFE: Many installed more than 25 years — Still O.K.

OPERATING RESULTS: Fully automatic steam control at lowest cost

PRICE: Good Buy - has no equal

AVAILABILITY: Stock item in Crane Line

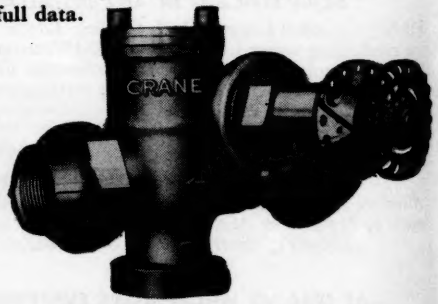
THE HISTORY

Steam generated at 130 psi is reduced through individual regulators on molding presses. Pressure used at machines is 60 to 100 psi depending on work. Features of regulator service needed most are: (1) non-fluctuating outlet pressure automatically maintained within close regulation; (2) easy adjustment by press operator to specified pressure for given work.

More than 25 years ago the plant standardized on Crane Regulators, a total of 225 being in use today. Many are the original installations, still delivering desired outlet pressure. Records for all regulators, regardless of age, show no maintenance cost other than prescribed simple routine servicing. On old models of the Crane 960 regulator, after prolonged service, this includes occasional regrinding of seats.

THE VALVE

Crane No. 960 Brass Pressure Regulators reduce steam or air pressures up to 250 psi, to within 80% of inlet pressure. Factory pre-set to operate within any of 4 ranges from 1 to 200 psi, with easily selected service pressure within set range. Precision made; fully automatic; highly dependable, even under reasonable fluctuation of inlet pressure. All wearing parts renewable. See your Crane Catalog or Crane Representative for full data.



The Complete Crane Line Meets All Valve Needs. That's Why—

More Crane Valves Are Used Than Any Other Make!

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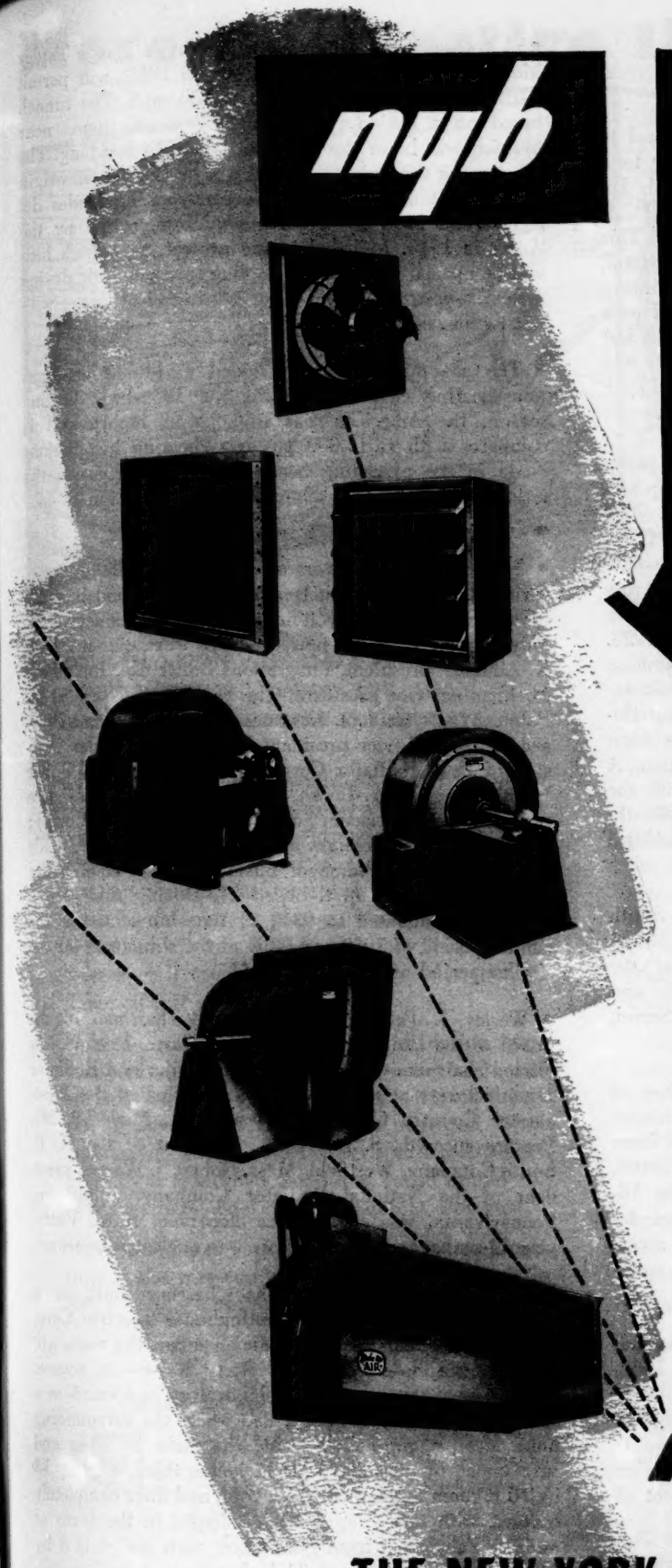

Two fan sizes: 18 inch and 24 inch, capacities from 2000 cfm to 6400 cfm. Overall height 55½ inches.

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PEDESTAL FAN

(Industrial Type)

Available for Prompt Shipment From Stock

Place this versatile fan in the most effective spot to deliver a gentle breeze or a brisk wind for a variety of uses. Safety guards front and rear with totally enclosed motors to meet State Industrial Safety Code Requirements. Bolted construction simplifies shipment, assembly and storage.

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THE NEW YORK BLOWER COMPANY

SALES OFFICES • 32nd STREET and SHIELDS AVENUE • CHICAGO 16

FACTORY, LAPORTE, INDIANA

BRIEFLY STATED

• Outlays for new construction in 1952 are expected to set a new record of over $32 billion, according to a statement released jointly by the Building Materials Division, U. S. Department of Commerce, and the U. S. Labor Department's Bureau of Labor Statistics. This will be about $1 billion more than the revised 1951 total, reflecting largely increased expenditures for military and atomic energy facilities. Private investment of over $21 billion in new construction will vary little from last year's total, but public outlays amounting to nearly $11 billion will represent an increase of $1.6 billion (17%) over 1951.

• Newly-created managerial positions in the volute pump section, process pump section and multi-stage pump section of the Centrifugal Pump Division have been filled according to an announcement by Worthington Corp. Roy Carter has been appointed manager of the volute pump section. After obtaining his A.B. and M.E. degrees from Columbia University he joined the engineering department of the Worthington organization in 1923. L. H. Garnar has been appointed manager of the process pump section. A graduate of Rensselaer Polytechnic Institute with an M.E. degree, Garnar joined the Centrifugal Pump Division in 1930. I. J. Karassik has been appointed manager of the multi-stage pump section. A graduate of Carnegie Institute of Technology with the degrees of B.S. and M.S., he has been with the Worthington organization since 1934 and the Centrifugal Pump Division since 1935.

• James F. Donnelly, an executive of the A. O. Smith Corp., was elected president of the Gas Appliance Manufacturers Association at the opening session of the group's 17th annual meeting, May 21. Mr. Donnelly succeeds Louis Ruthenburg, chairman of the board of Servel, Inc.

• Appointment of Milton Levine to the position of assistant chief engineer of the air conditioning division of the Mitchell Manufacturing Co., Chicago, has been announced. Mr. Levine, formerly a resident of Cincinnati, Ohio, was consulting and design engineer with the All-States Engineering Co. He also held the position of design engineer on the General Electric jet engine accessories program, and was test engineer for the Kramer-Trenton Company.

• At the thirty-fifth annual meeting of the National Association of Fan Manufacturers, Inc., May 9, 1952, the following officers were elected for the ensuing year: R. A. Wasson, president; J. M. Frank, vice president; and L. O. Monroe, secretary-treasurer. Mr. Wasson is vice president and general manager of the Clarage Fan Co., Kalamazoo, Mich., while Mr. Frank is president of the Ilg Electric Ventilating Co., Chicago, Ill.

• B. J. Lattner, formerly vice president and heating sales manager, has been elected executive vice president and general manager of Century Engineering Corp., Cedar Rapids, Iowa.

• A transonic wind tunnel at the Navy's David Taylor Model Basin, when completed late in 1953, will permit testing of models at speeds up to 900 mph. The tunnel, based on a design partly built by the Germans near Munich, will be of closed circuit type, 574 feet long. The wind going through this tunnel will be German in origin —a 19 foot double fan with contra-rotating blades designed and built by German engineers, seized by the Allies in 1945. Included in the project, for which bids will be opened May 28, is a cooling tower and air drying system. Construction will be of reinforced concrete, with test section of steel.

• The gas utility industry added 1,514,000 new gas househeating customers during the 1951-1952 heating season, the American Gas Association reported. This compares with 1,014,000 gas househeating installations made in the preceding heating season, and raises the industry's composite gas househeating saturation to 44.7 percent.

• Sixty-five manufacturers of steel boilers, heating accessories, and allied products attended the annual meeting of the Steel Boiler Institute at Hershey, Pennsylvania, May 12 and 13. Four new directors were chosen: Paul K. Addams, president, Fitzgibbons Boiler Co., Inc.; Paul M. Fleming, vice president, The Bigelow Co.; Elbert M. Palmer, vice president, Kewanee Boiler Corp., and Howard B. Steggall, vice president, Pacific Steel Boiler Division of U. S. Radiator Corp. Officers of the Steel Boiler Institute are: R. A. Locke, president; A. P. Weiss, vice president (vice president and secretary, Burnham Corp.); and R. A. Locke, secretary and treasurer. Mr. Locke made a report on the volume of business in the steel boiler industry for 1952 up to April 27. During this period, shipments amounted to 93% of the shipments for the similar period of 1950 and 62% of the shipments for the similar period of 1951.

• Wesley J. Peoples, president and chairman of the board of the United States Radiator Corp., Detroit, was elected chairman of The Institute of Boiler and Radiator Manufacturers at the 37th annual meeting at the Westchester Country Club, Rye, New York, May 7-9. Mr. Peoples succeeds S. K. Smith, president of the H. B. Smith Company, Westfield, Mass. Robert S. Waters, president of the National Radiator Company, Johnstown, Pennsylvania, was elected vice chairman. R. E. Ferry, general manager of the Institute was re-elected treasurer.

• A point of no return for echoes has been built into a new sound laboratory by Westinghouse Electric Corp. More precisely called an anechoic chamber, the room will enable research engineers to study noise—its source, cause, and measurement. The laboratory is located in a suburban area of Pittsburgh, Pa., where the surrounding noise level is quite low. Inside the main building and surrounded by masonry walls 12 inches thick, a 19 by 13 by 10 ft room has had its walls, roof, and floor completely covered with insulating material shaped in the form of wedges. Fabricated from glass wool, each wedge is 8 by 24 inches at its base and 34 inches long. A spring supported wire net is stretched from all four side walls several feet above the wedges which cover the floor of the chamber.

More Destructive than Termites!

CONDENSATION WILL MAKE PAINT PEEL, PLASTER CRUMBLE, WOOD ROT, AND MASONRY AND MORTAR DETERIORATE.

Ordinary insulation in walls lets water vapor flow through, condense, accumulate and cause damage. Vapor is a gas. It flows through walls from high vapor density areas to low. Cold air can retain less vapor in suspension, and creates a low density area. Vapor pierces plaster, wood, brick, stone, asphalt, building paper, ordinary insulations. Wherever it touches a substance colder than its dew-point, it condenses.

Inside walls, within ordinary insulation, onto and within siding or sheathing, onto inner wall surfaces, vapor flows and condenses if a vapor barrier of **zero** permeability is not provided. Upon condensing, it stimulates fungi and insects which greedily break down wood and cause timber rot. It makes paint peel, plaster crumble, iron rust.

Impervious to vapor, multiple accordion aluminum is also non-condensation-forming. The slight mass of the aluminum sheet on the warm side (1/5 oz. per sq. ft.) approximates the adjacent air's temperature (by conduction) so quickly that it can extract very little heat from it. Therefore the air can retain its vapor content in suspension, without otherwise resulting condensation.

Each aluminum sheet throws back 97% radiation on the warm side, emits but 3% on the cold. On the cold side, each aluminum sheet is slightly warmer than adjacent air, and heats it. Therefore the capacity of the air to retain vapor in suspension is slightly increased, and no dewpoint is ever reached. Nowhere on nor within multiple accordion aluminum does condensation formation occur.

The aluminum and fiber sheets block inner and outer convection. In addition, the air spaces practically eliminate conduction.

Multiple accordion aluminum is commercially available as Infra Insulation, Types 6, 4, and 4 Jr. For a complete discussion of the subject, ask us to send at our expense, Schwartz's "Simplified Physics of Vapor and Thermal Insulation," and the Government booklet, "Insulation and Weather-Proofing" (Div. Farm Bldgs. & Rural Housing).

INFRA WALL HEAT FLOW THERMAL FACTORS

Type 6	C. 073, R 13.69 = 5⅝" dry Rockwool
Type 4	C. 107, R 9.34 = 3¾" dry Rockwool
Type 4 Jr.	C. 123, R 8.13 = 3⅓" dry Rockwool (Type 4 Jr. in 1" Space)

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( ) Please send free literature on how to avoid damage by condensation.
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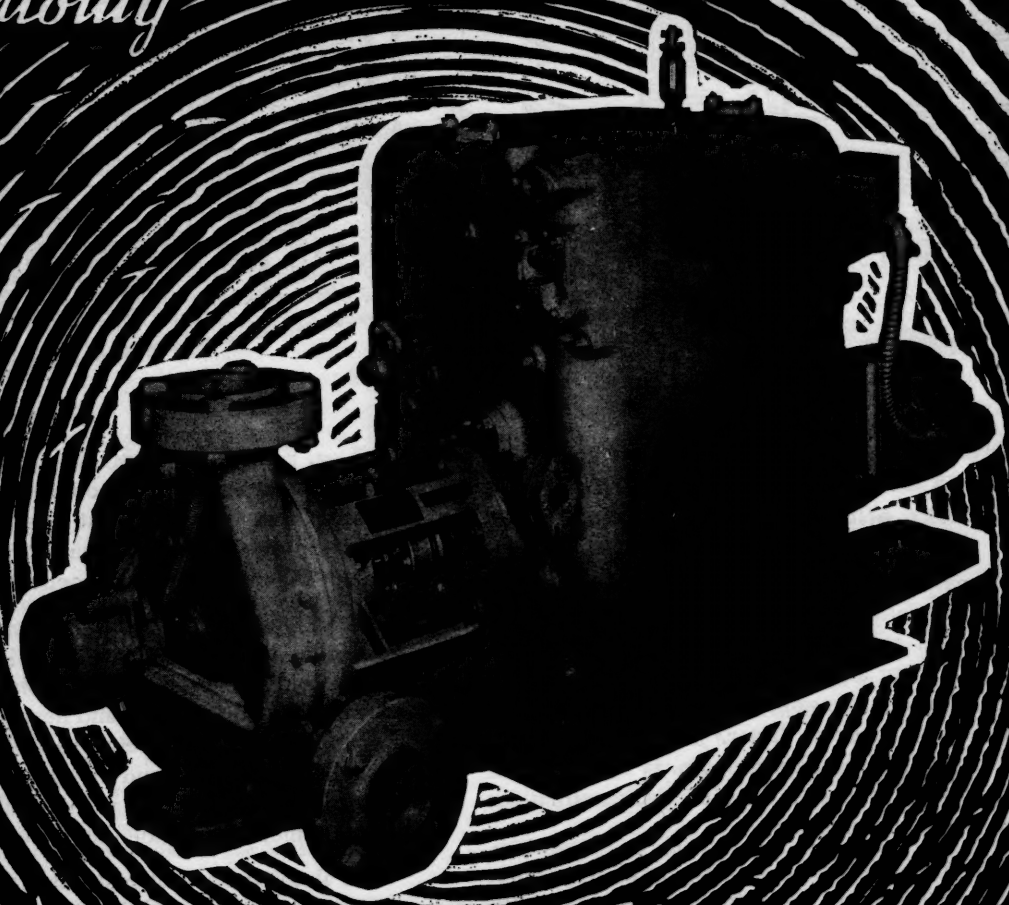
Centralized Heating Economy



A RETURN LINE VACUUM PUMP THAT CUTS HEATING COST.

This unusual pump needs no electric current, cutting out greatest item of pump operating expense.

More important, this pump insures absolutely uniform circulation in system. That means continuous steam economy.

Simple, compact, one moving element, no wearing parts, no internal lubrication. Bulletin No. 203 gives the facts. Your copy is waiting.

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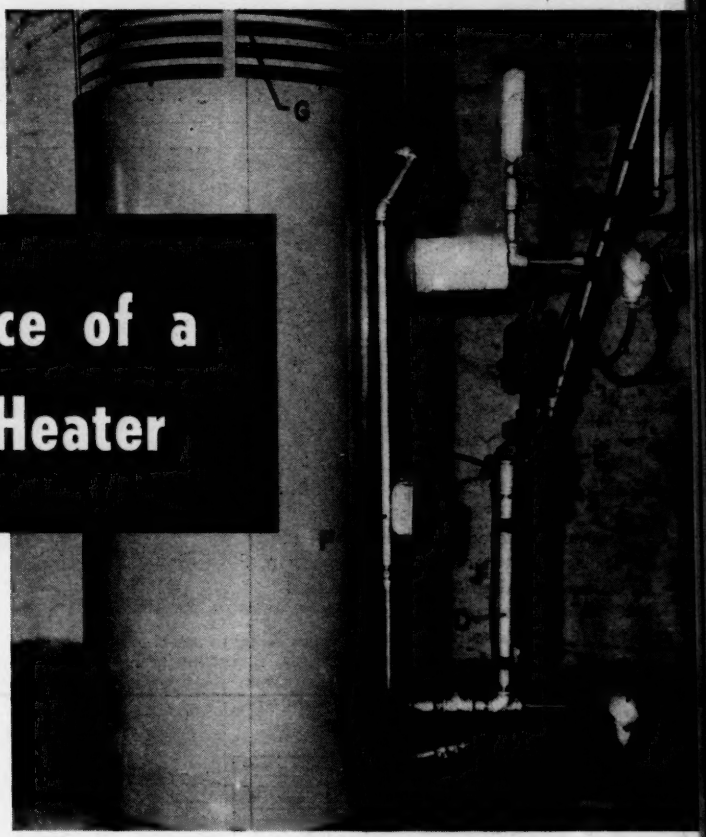


Fig. 1. Heat pump water heater, installed in basement of author's home.

Operating Performance of a Heat Pump Water Heater

E. B. PENROD

Department of Mechanical Engineering, University of Kentucky, Lexington, Ky.

A study of a Master Kraft heat pump water heater was made during 1951. Five tests of short duration were made to determine the heating energy ratio and during these tests, water flowed continuously at a constant rate, through the storage tank of the unit. One test 97 minutes long was made when no water flowed through the storage tank, to obtain performance data that could be compared with those taken under different conditions. A test of long duration was made in which data were taken daily from June 16 to August 15, to study the operating performance of the heat pump water heater as it was used to supply hot water for a family of two. The relative humidity and the condensed moisture removed from the basement air were measured.

A HEAT pump water heater, Fig. 1*, was installed in basement of the author's house on January 1, 1951, by the Kentucky Utilities Co. When in operation, this heat pump water heater takes heat from the basement air and transfers it to the water in the storage tank. Data shown in the schematic diagram, Fig. 2, were taken one day during the summer of 1951, and will be referred to in explaining the operating principle of this type of water heater.

Illustrated in Fig. 1 are A, the hot water resistance thermometer; B, cold water resistance thermometer; C, hot water pipe; D, cold water pipe; E, Bailey area water meter; F, drain pipe used for collecting moisture condensed from basement air; G, evaporator coil.

*The Kentucky Utilities purchased a Master Kraft heat pump water heater made by Harvey-Whipple, Inc., Springfield, Mass. and installed it in the basement of the author's house in Lexington, Ky. It also installed the recording instruments used during the investigation.

The compressor circulates Freon-12 and also maintains a pressure of 171.8 lb per sq in absolute (psia) on one side of the expansion valve and a pressure of 74.8 psia on the other. The circulating fan draws air from the basement at 76F and forces it through the evaporator or air coil. The air gives up heat to the refrigerant in the evaporator and is cooled to 70F. The refrigerant changes from the liquid to the vapor phase in the evaporator as it absorbs heat from the air. Vapor is drawn into the compressor at 62F and 74.8 psia pressure. It is then compressed to a temperature and pressure of 382F and 171.8 psia. The discharge temperature of the Freon-12 was calculated from data taken.

During the compression process, the refrigerant absorbs shaft work (heat equivalent of the work of compression). The superheated vapor then enters the condenser, located near the bottom of the storage tank; the vapor cools and then condenses. While the vapor cools and condenses, the heat which it picked up in passing through the evaporator and compressor is transferred to the water in the storage tank. The water temperature is increased from 80F to 155F. In passing through the condenser, the refrigerant changes from the vapor to the liquid phase, and it moves through the expansion valve where its pressure drops from 171.8 to 74.8 psia.

Heat absorbed by the water while its temperature changes from 80 to 120F is about 53.4% of the heat absorbed to increase its temperature from 80 to 155F, and is supplied by the refrigerant in condensing at 120F. The remainder of the heat, 46.6%, is absorbed by the water in cooling the refrigerant from 382 to 120F.

The Master Kraft heat pump water heater, Model 1/3-55-1, studied in this investigation is 26¾ inches in

TABLE 1—RESULTS FROM FIVE SHORT TESTS

During tests water was flowing through the storage tank of a Master Kraft heat pump water heater

Date	Jan. 1	May 30	July 15	Aug. 12	Aug. 13
Duration of test, min.	120	55	94	52	48
Electric power supplied, kw	0.567	0.56	0.517	0.596	0.596
Temp. of air entering evaporator coil, F	64	72	75	76	76
Temp. of air leaving evaporator coil, F	58	64	70	71	71
Dry bulb temp. of basement air, F	64	72	75	76	76
Wet bulb temp. of basement air, F	48	65	71	72	72
Relative humidity of basement air, F	26	69	83	83	83
Average hot water temperature, F	74.9	138	108.6	116.8	116.1
Average cold water temperature, F	56.7	78	87.6	88	88
Increase in water temperature, F	18.2	60	21	28.8	28.1
Water heated, gallons	61.1	9.53	38.3	19.2	19.2
Water heated, lb	510	79.5	318	159.1	159.0
Energy supplied to heat pump, kwhr	1.134	0.514	0.81	0.516	0.477
Energy supplied to heat pump, Btu	3870	1755	2587	1761	1627
Energy delivered to water, kwhr	2.73	1.398	1.957	1.341	1.309
Energy delivered to water, Btu	9280	4770	6678	4580	4468
Deg. superheat at end of compression, F	86.4	58.7	80.4	37	57.5
Compressor discharge pressure, psia	132.7	161.7	145.9	150.7	149.7
Compressor suction pressure, psia	62.7	72.7	74.8	75.7	75.7
H.E.R., refrigeration cycle	12.6	10.5	12.8	12.1	12.0
H.E.R., heat pump water heater	2.4	2.7	2.4	2.3	2.7

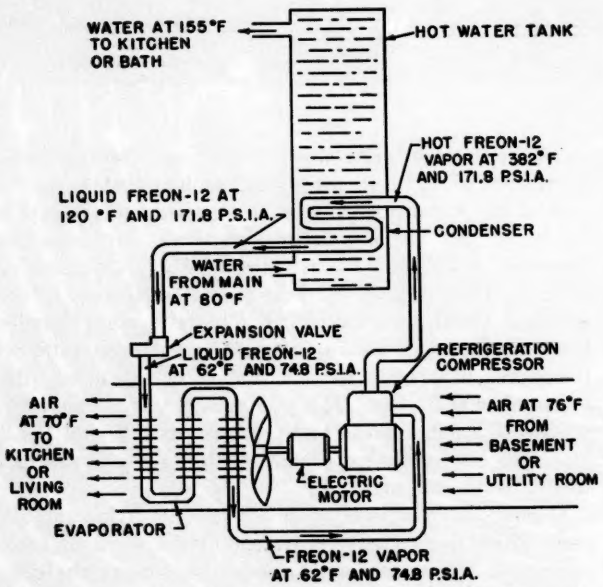

WATER AT 155°F TO KITCHEN OR BATH
HOT WATER TANK
HOT FREON-12 VAPOR AT 382° F AND 171.8 P.S.I.A.
LIQUID FREON-12 AT 120 °F AND 171.8 P.S.I.A.
CONDENSER
WATER FROM MAIN AT 80°F
EXPANSION VALVE
LIQUID FREON-12 AT 62°F AND 74.8 P.S.I.A.
REFRIGERATION COMPRESSOR
AIR AT 70°F TO KITCHEN OR LIVING ROOM
AIR AT 76°F FROM BASEMENT OR UTILITY ROOM
ELECTRIC MOTOR
EVAPORATOR
FREON-12 VAPOR AT 62°F AND 74.8 P.S.I.A.

Fig. 2. Diagram showing how a heat pump produces hot water for domestic needs.

diameter and 70 inches high. It has a capacity of 53 gal and weighs 680 lb empty. The compressor and fan motors are rated at 1/3 and 1/20 hp, respectively. With the exception of the condenser, the refrigeration plant is located near the top of the unit (Fig. 3 and 4).

The upper blade of the fan draws air through the evaporator coils and discharges it through a grill at the top, while the lower one tends to force warm air against the hermetically sealed compressor motor combination. Provision was made to drain off the moisture that is condensed from the air drawn through the evaporator coils during hot humid weather.

A Bailey area water meter and temperature recorder was used to measure the quantity of hot water used, and also the inlet and outlet water temperatures (Fig. 1 and 5).

The Bailey meter was equipped with an integrator which was used to determine the quantity of water used each day. The chart revolved so slowly that the graphic record of the water meter was practically useless in this investigation since the hot water was drawn from the storage tank at frequent intervals and at different rates. The graphical records of the hot and cold water temperatures were used primarily during tests of short duration.

The Esterline-Angus graphic watt meter was employed primarily to determine the frequency of operation and the operating time of the heat pump water heater. The General Electric watthour meter served to find the electric

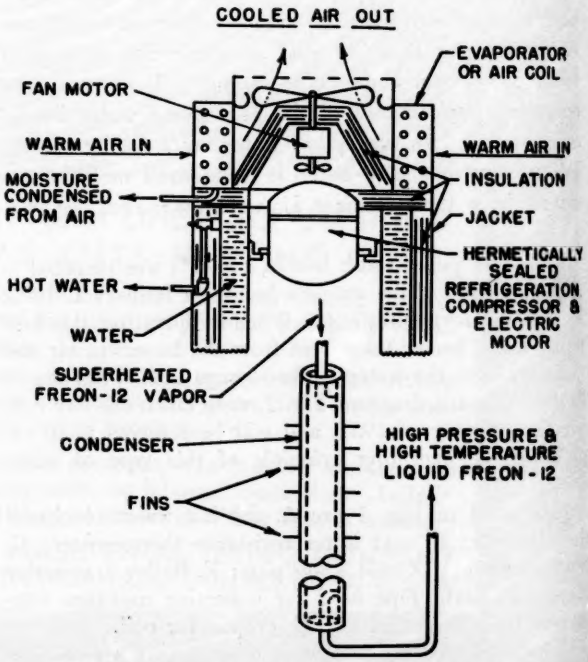


Fig. 3. Essential parts of the refrigeration plant of the heat pump unit, except the expansion valve.

energy supplied to the heat pump water heater and the daily power demand. A Bristol wet and dry bulb recorder was used to get the relative humidity of the basement air near the heat pump water heater as well as the temperature of the basement air. A sling psychrometer was used to check the readings of the Bristol recorder.

Flow Tests Of Short Duration

During the normal intermittent operation of a domestic heat pump water heater, it is virtually impossible to determine the heating energy ratio of the unit because water does not flow in a steady stream through the storage tank. Hot water may be drawn out of the tank a great deal of the time intermittently when the unit is not in operation, and the cold water which enters the tank merely mixes with the hot water, thereby reducing its temperature. In addition, hot water is generally drawn off at such a high rate that the heat pump does not have the capacity to maintain a constant temperature differential between the water at entrance to and exit from the storage tank.

To determine the heating energy ratio of the heat pump water heater, five tests of short duration were made in which water flowed through the tank at a constant rate. Polytropic compression was assumed in making calculations to determine the work of compression, and the steady flow equation was used when required.

A polytropic process is one which obeys the law pv^n=constant, where n is a constant during the process. It may have any value from zero to infinity, depending upon the process. In contrast to this, an isentropic process is one which obeys the law pv^k=constant, where k is the ratio of the specific heat of the substance at constant pressure to that at constant volume.

The calculations are given in Appendix 1 and the results in Table 1.

Non-Flow Test Of Short Duration

The heating energy ratio of the refrigeration cycle and the heat pump water heater, determined in the steady flow

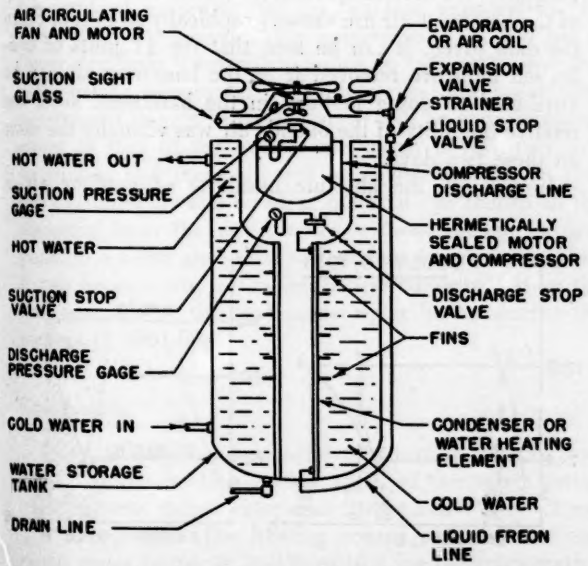


Fig. 4. General construction of the Master Kraft heat pump water heater.

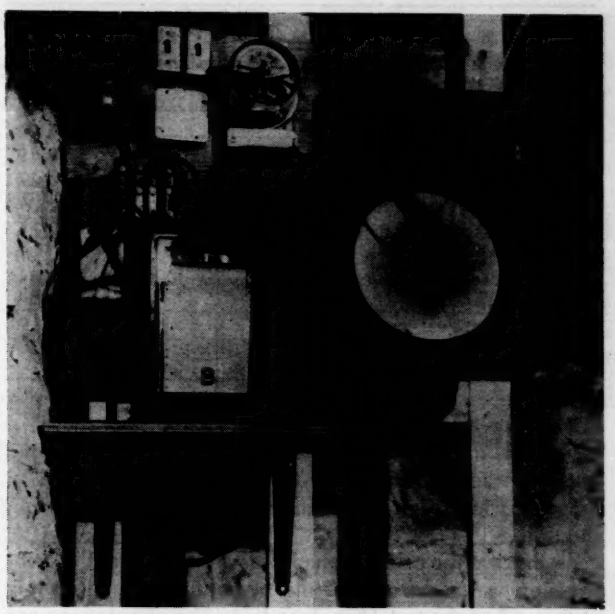


Fig. 5. Bailey area water meter and temperature recorder, A; Esterline-Angus recording watt meter, B; General Electric single phase watthour meter, C. Photo Courtesy of Kentucky Utilities Co.

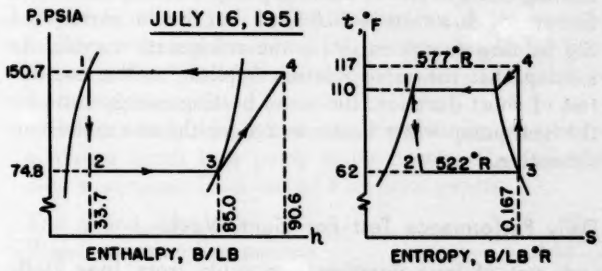


Fig. 6. Refrigeration cycle on pressure-enthalpy and temperature-entropy planes for non-flow test shortly after heat pump water heater was set in operation.

tests of short duration indicate, approximately, the performance of the unit when in actual service to produce hot water for domestic purposes. The heat pump water heater often operates at night, and at other times when no hot water is drawn from the storage tank.

The following data were taken on July 16, 1951, to determine the performance of the heat pump water heater when no water was drawn from the storage tank: Suction press, psia, initial, 74.8 and final, 74.8; discharge press, psia, initial, 150.7 and final, 181.8.

Temperature of water at entrance to tank, F	80
Temperature of water at exit from tank, F	155
Basement dry bulb temperature, F	75
Basement wet bulb temperature, F	71
Temperature of air entering evaporator coils, F	75
Temperature of air leaving evaporator coils, F	70
Hot water drawn from storage tank, lb	0
Duration of test, minutes	97

Before the test was started, water was drawn from the storage tank until the water temperatures at entrance and exit were 80F and 140F, respectively. In the meantime, the thermostat set the heat pump water heater in operation. After the heat pump water heater stopped, a little hot

TABLE 2—AVERAGE NORMAL DAILY PERFORMANCE
Data for a Master Kraft heat pump water heater for period from June 15 to August 15, 1951

Operating time, hours per day	6.91
Total electric energy supplied to house, kwhr per day	8.49
Electric energy supplied to heat pump, kwhr per day	4.27
Heat pump power demand, kw	0.596
Hot water used, gal per day	38.7
Cost, kwhr per gal	0.11
Condensed moisture removed from basement air, pints per day	2.54
Discharge pressure, psig	160
Suction pressure, psig	62.2

water was drawn from the storage tank to determine the hot water temperature. The temperature of the water in the cold water pipe remained essentially constant during the test.

In making the calculations it was assumed that the compression was isentropic at the beginning and polytropic at the end of the test (Fig. 6 and 7). The calculations are given in Appendix 2.

The mean value of the heating energy ratio of the refrigeration cycle for the non-flow test of short duration is $\frac{1}{2} \times (10.2 + 12.6)$ or 11.4. The average value of the heating energy ratio of the heat pump water heater for the five steady flow tests is 20.8% of that for the corresponding heating energy ratio for the refrigeration cycle. Assuming that the same relation applies for the non-flow test of short duration, the mean heating energy ratio for the heat pump water heater is 2.4 for the test under consideration.

Daily Performance Test For Eight Weeks

A test of long duration was made from June 16 to August 15 to determine the performance of the heat pump water heater while in actual service. The data taken during this test are listed in Table 2. During this period the heat pump water heater supplied hot water for a family of two. Hot water was drawn from the storage tank as needed, that is, water flowed through the storage tank intermittently and at different discharge rates. The heat pump operated at times when water was not drawn from the storage tank; it operated also at times when water was being drawn from the tank. Two electric meters had been installed on the outside of the house. One registered the electric energy supplied to the electric appliances, heat pump water heater, and the instruments; and the other meter registered the electric energy supplied to the Master Kraft heat pump and the Bailey meter. The electric meter *C*, Fig. 5, registered the electric energy supplied to the heat pump water heater and its daily power demand.

With a few exceptions, laundry was always done in the basement on Mondays. The operating time of the heat pump water heater and the hot water consumption was in general greater on these days. The average operating time and the hot water consumption for the 8-week test are 6.91 hrs per day and 38.7 gpd, respectively. On the average, the heat pump water heater consumed approximately 50.3% of the electric energy supplied to the house during this test. The average daily power demand of the heat pump water heater was 0.596 kw as given in Table 2.

The dry bulb and wet bulb temperatures of the basement air decrease almost immediately and simultaneously after the heat pump water heater is set in operation. Study Fig. 8. At nights during the summer, the dry bulb and wet bulb temperature return to their former values very soon after the unit has stopped operating. The dry bulb temperature, wet bulb temperature, and relative humidity, for example, were 76.3F, 71.4F, and 79.4%, respectively, at 6:15 Sunday morning, June 24, when the heat pump water heater was idle. See chart of Fig. 8. Fifteen minutes later, however, when the unit was in operation the dry bulb temperature, wet bulb temperature, and relative humidity were 75F, 70.8F, and 82.2%, respectively. At 8:00 a.m., the same morning, these readings were 76F, 71F, and 79%, respectively, when the heat pump water heater was not in operation.

In general the maximum quantity of moisture was removed from the basement air on days in which laundry was done, and on days when the relative humidity of the atmosphere was very high. On July 16 and 23, the heat pump water heater removed 12 and 11 pints, respectively, of condensed vapor from the basement air. Clothes and linen were washed in the basement and the laundry was hung there to dry. It should be pointed out that several tests of short duration were also made on July 16 in which water flowed slowly and continuously through the storage tank. This accounts, in part, for the high values recorded for the operating time of the heat pump water heater, hot water drawn from the storage tank, and the moisture removed from the basement air.

Zero rainfall was recorded at the U. S. Weather Bureau Station at the Blue Grass Airport, six miles from the heat pump installation, on Sunday, July 22. The average value of the relative humidity at the airport was 80.1%. On this day the heat pump water heater removed only one pint of condensed moisture from the basement air.

The rainfall at the Blue Grass Airport was recorded as "trace" on Monday, July 23. The average value of the relative humidity at the airport was 82%. On this day the heat pump water heater removed 11 pints of condensed moisture from the basement air. The effect of the operation of the heat pump water heater on the dry bulb temperature, wet bulb temperature, and the relative humidity of the basement air are shown graphically in Fig. 8. From the data given, it can be seen that the 11 pints of condensed moisture removed from the basement air can be attributed to doing laundry in the basement, since the relative humidity of the outside air was virtually the same on these two days.

In general, the absolute humidity of outdoor air is

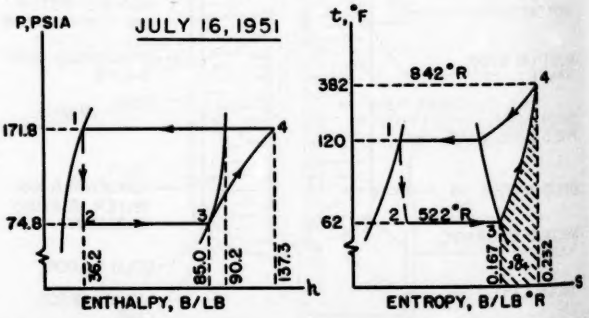


Fig. 7. Refrigeration cycle for the non-flow test just before the heat pump water heater stopped.

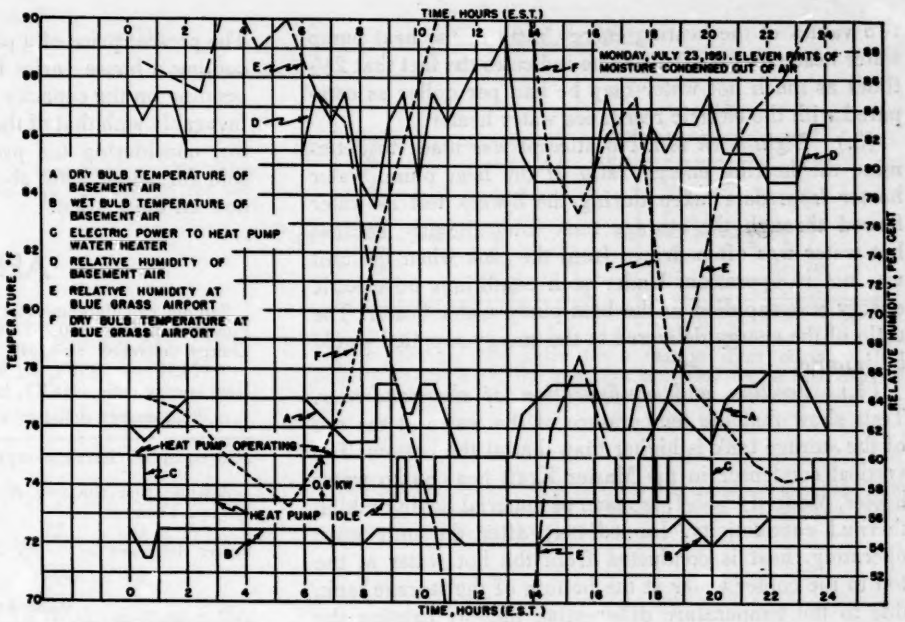

TIME, HOURS (E.S.T.)
MONDAY, JULY 23, 1951. ELEVEN PINTS OF MOISTURE CONDENSED OUT OF AIR
A DRY BULB TEMPERATURE OF BASEMENT AIR
B WET BULB TEMPERATURE OF BASEMENT AIR
C ELECTRIC POWER TO HEAT PUMP WATER HEATER
D RELATIVE HUMIDITY OF BASEMENT AIR
E RELATIVE HUMIDITY AT BLUE GRASS AIRPORT
F DRY BULB TEMPERATURE AT BLUE GRASS AIRPORT
HEAT PUMP OPERATING
0.8 KW
HEAT PUMP IDLE
TEMPERATURE, °F
RELATIVE HUMIDITY, PER CENT
TIME, HOURS (E.S.T.)

Fig. 8. Effect produced on dry bulb temperature, wet bulb temperature and relative humidity of basement air due to operation of the heat pump water heater on July 23, 1951.

higher in summer in cold climates than that during winter. If there are no sources (or sinks) of moisture, the inside air will assume the same absolute humidity as that of the outdoor air during cold winter weather. Moisture absorbed by the building material during humid summer weather will migrate to the outdoor air during cold winter weather. Therefore, the building material will become dry and will have the capacity to absorb all of the moisture liberated when laundry is done and hung within the house to dry during cold weather. Also, the vapor pressure in the basement air will be increased in proportion to the moisture absorbed. Some of the moisture will migrate to the outdoor air due to the existing difference in vapor pressure.

For moisture condensation to occur, the surface temperature of the evaporator of the heat pump water heater must be below the dew point temperature of the air passing over the coil. In summer the dew point temperature of the basement air is raised by the drying laundry to a temperature exceeding the coil surface temperature. In the winter, the basement air passing over the coil has a lower dry bulb temperature which in turn will lower the coil surface temperature. However, the dew point temperature of the air in the basement will be approximately equal to that of the outside air which is relatively low in winter, and therefore will be sufficiently low so that the basement air and building material can absorb all the moisture from the wet laundry without raising its dew point to a value above the coil surface temperature. Thus it can be seen why no moisture was condensed from the basement air by the heat pump water heater during the winters of 1951-52.

Conclusions

(1.) *Steady flow tests of short duration.* The average values of the heating energy ratio of the refrigeration cycle and heat pump water heater were found to be 12 and 2.5, respectively. The heating energy ratio of the heat pump water heater is 20.8% of that for the refrigeration cycle. The average values of the temperature of the superheated vapor and degree superheat at discharge are 172F and 64F, respectively. The average values of the discharge and suction pressures for the steady flow tests are 148.1 and 72.3 psia, respectively, and 174.7 and 76.9 psia, respectively, for the 8-week test where hot water was produced under actual service. All results should be interpreted in the light of the assumptions made while making the calculations.

Freyder and Oldacre made a somewhat similar study of a Master Kraft heat pump water heater. The following data were taken from one of Freyder's papers:

Test period, days	91
Water consumption, gallons	5117.7
Electric energy consumption, kwhr	427.0
Gallons per kwhr	12
Gallons per day, avg.	56.3
Demand, watts	560
Basement air temperature, F, avg.	70
Water inlet temperature, F, avg.	67.9
Water outlet temperature, F, avg.	140
Load factor, %	34.7
Performance factor	2.14

The results reported in this investigation compare favorably with those reported by Freyder. The performance factor obtained by Freyder shows that 2.14 times as much hot water per dollar, other factors being the same, can be obtained with the heat pump water heater as compared with the ordinary electric resistance water heater. For a 60-day test, Oldacre reports that 2.19 times as much hot water per dollar can be obtained with a heat pump water heater as compared with the conventional electric resistance water heater.

(2.) *The non-flow test of short duration.* The calculated value of the degree of superheat at discharge and the heating energy ratio of the refrigeration cycle at the beginning of the test were 7F and 10.2, respectively, while at the end of the test they were 262F and 12.6. The average value of the heating energy ratio from the five steady flow tests of short duration is 2.5, and the calculated value obtained from the non-flow test is 2.4. The mean of these

two values of the heating energy ratio of the heat pump water heater is 2.45. This value indicates the fact that 2½ times as much hot water may be had per dollar as compared with the electric resistance water heater.

(3.) *Eight-week test.* No attempt was made to determine the heating energy ratio of the heat pump water heater from data taken during the 8-week test as water flowed through the storage tank intermittently because hot water was often drawn from the tank when the unit was not in operation. Under such conditions no electric energy was supplied to the heat pump water heater. The ratio of the energy delivered to the energy supplied would be infinite.

(4.) *Position and configuration of the condenser.* Tests show that the temperature of the water at the top of the storage tank is higher than that at the bottom. The vertical condenser in the Master Kraft heat pump water heater, Model 1/3-55-1, is made of material having a high thermal conductivity. Immediately after the unit stops operating, heat is conducted from the hot water at the top to the colder water at the bottom of the storage tank, due to the temperature differential, thereby causing the thermostat to start the unit much sooner than if the condenser had the configuration and position of that shown in Fig. 2.

(5.) *Effect on the temperature of the basement air.* The heat pump water heater, due to its small refrigeration capacity, does not lower the average temperature of the basement air very much during hot weather since considerable heat is transferred to the air from the warm basement walls by radiation and convection. The heat pump water heater does lower the average temperature of the basement air during cold weather since it removes heat from the air reducing its temperature approximately to that of the surrounding walls. The basement air now cannot absorb heat from the walls. Heat is transferred to the basement air from the floor above, and as a result of this, the air temperature in the room above the hot water heat pump is thereby lowered to the extent that the house thermostat automatically starts the gas-fired furnace in the basement of the house under consideration. There are many advantages obtained by the use of a hot water heat pump which off-set the disadvantage mentioned.

(6.) *Chief advantages of the hot water heat pump.*

(a) An all-electric home is now a reality because hot water can be produced much cheaper with a heat pump water heater than with an electric resistance heater.
(b) Produces a high load factor for the electric utility.
(c) Dehumidifies the air in the basement or utility room during hot weather.
(d) Laundry dries much faster in a room where the heat pump water heater operates.
(e) It is not necessary to carry heavy wet laundry out of the house to dry.
(f) Laundry hung out of doors to dry is subject to weather changes and dirt in the atmosphere.
(g) The heat pump water heater can supply all the hot water needed and at the temperature desired.
(h) In the all-electric house, hot water, heating and cool-cooling can be produced with electricity thereby eliminating the disadvantages that occur in the use of solid, liquid, and gaseous fuels.

(7.) *Cost of the heat pump in an all-electric house.* The present price of a package heat pump for heating and cooling a house varies from about $2,700 to $6,000, depending on the capacity of the unit. These prices compare favorably with that of the first household electric refrigerator, considering the present value of the dollar, which sold for about $900 about 30 years ago when they were new on the market.*

APPENDIX I

Sample calculations—test made January 1, 1951.

Energy supplied = 0.567 kw × 2 hr = 1.134 kwhr = 3870 Btu

Energy delivered = (510 lb) × [1.0 Btu per lb (F)] × (74.9F − 56.7F), = 9280 Btu (Fig. 10) = 2.73 kwhr

Heat energy ratio (HER), heat pump water heater =

$$\frac{\text{heat energy deliv. to water}}{\text{heat equiv. of electric energy supplied}} = \frac{9280}{3870} = 2.4$$

Assume that the two electric motors operate at 1/20-hp and 1/3-hp. Then

$$\text{Power delivered} = \frac{23}{60}\ \text{hp} \times 0.746\ \text{kw per hp} = 0.286\ \text{kw}$$

$$\text{Motor efficiency} = \frac{0.286\ \text{kw}}{0.567\ \text{kw}} \times 100 = 50.4\%$$

Motor losses transferred to the F-12 or water in storage tank = 3870 Btu × (1.000 − 0.504) = 1920 Btu

Heat absorbed by F-12 in the evaporator from air stream = 9280 Btu − 3870 Btu = 5410 Btu

Refrigeration effect = $h_3 - h_2$ (Fig. 9a)
= 83.9 Btu per lb − 31.3 Btu per lb = 52.6 Btu per lb.

$$\text{F-12 circulated} = \frac{5410\ \text{Btu}}{52.6\ \text{Btu per lb}} = 102.7\ \text{lb in 2 hrs}$$

$$\text{Then } \frac{102.7\ \text{lb}}{120\ \text{min}} = 0.856\ \text{lb per min}$$

Heat absorbed by the water from F-12 in the condenser = 9280 Btu − 1920 Btu = 7360 Btu

$$q_{1\text{-}4} = \frac{7360\ \text{Btu}}{102.7\ \text{lb}} = 71.7\ \text{Btu per lb}$$

$q_{1\text{-}4} = h_4 - h_1$
71.7 Btu per lb = h_4 − 31.3 Btu per lb
h_4 = 103.0 Btu per lb

For a pressure and enthalpy of 132.7 psia and 103 Btu per lb, respectively, the temperature and entropy of the superheated vapor were found from a Mollier chart to be 187F and 0.19 Btu per lb (R). Where R is the absolute temperature, F deg.

Degree of superheat = 187F − 100.6F = 86.4F

$q_{3\text{-}4} = ½ (T_3 + T_4) (s_4 - s_3)$
= ½ (511R + 647R) (0.19 − 0.168) Btu per lb (R)
= 12.7 Btu per lb

Assume that the steady flow equation applies, then

$$h_3 + q_{3\text{-}4} + \frac{W_{3\text{-}4}}{J} = h_4$$

Where W = work done by the system and J = mechanical equivalent of heat. Then

$$83.9\ \text{Btu per lb} + 12.7\ \text{Btu per lb} + \frac{W_{3\text{-}4}}{J} = 103\ \text{Btu per lb}$$

$$\frac{W_{3\text{-}4}}{J} = 6.4\ \text{Btu per lb}$$

Heating energy ratio of the refrigeration cycle (HER)

$$= \frac{h_4 - h_1}{\frac{W_{3\text{-}4}}{J}}$$

*The author is greatly indebted to the Heat Pump Committee of the Kentucky Utilities Co. for valuable assistance throughout the investigation.

$$= \frac{103.0 \text{ Btu per lb} - 31.3 \text{ Btu per lb}}{6.4 \text{ Btu per lb}} = 11.2$$

APPENDIX 2

Calculations: Assume that the F-12 is condensed at 120F. The mean specific heat of F-12 at 171.8 psia was computed by the use of the equation

$$C_p = \frac{\Delta h}{\Delta t}$$

$$= \frac{(125.8 - 90.2) \text{ Btu per lb}}{(320 - 120) \text{ F}} = 0.18 \text{ Btu per lb (F)}$$

In condensing at 120F, one lb of F-12 changes the temperature of w lb of water from 80F to 120F, then

$w \times$ [1.0 Btu per lb (F)] (120F − 80F) = (90.2 − 36.2)
= 54 Btu per lb (Fig. 7)

where 54 is the quantity of heat given up by one pound of F-12 in condensing. Therefore, w = 1.35 lb.

The heat required to change the temperature of 1.35 lb of water from 120F to 155F

= (1.35 lb) [1.0 Btu per lb (F)] (155F − 120F)
= 47.3 Btu

Therefore, 47.3 Btu are given up by 1.0 lb of superheated F-12 vapor in cooling from t°F to 120F. Hence,

(1.0 lb) [0.18 Btu per lb (F)] (t − 120) = 47.3 Btu

Therefore, t = 382F, the temperature of the superheated F-12 vapor at discharge.

The enthalpies of F-12 at 171.8 psia of the saturated liquid, saturated vapor, and superheated vapor are 36.2, 90.2, and 137.3 Btu per lb, respectively. The heat given up by 1.0 lb of F-12 in cooling and condensing under the given conditions is 137.3 − 36.2, or 101.1 Btu. And

$$\frac{(90.2 - 36.2) \text{ Btu per lb}}{(137.3 - 36.2) \text{ Btu per lb}} \times 100 = 53.4\%$$

That is, 53.4% of the heat given up by one pound of F-12 in cooling and condensing is utilized in raising the temperature of 1.35 lb of water from 80F to 120F. Then 46.6% is used in raising the temperature of 1.35 lb of water from 120F to 155F.

The heating energy ratio of the refrigeration cycle, Fig. 6, at the beginning of the test is given by

$$HER = \frac{h_4 - h_1}{h_4 - h_3}$$

$$= \frac{(90.6 - 36.2) \text{ Btu per lb}}{(90.6 - 85.0) \text{ Btu per lb}} = 10.2$$

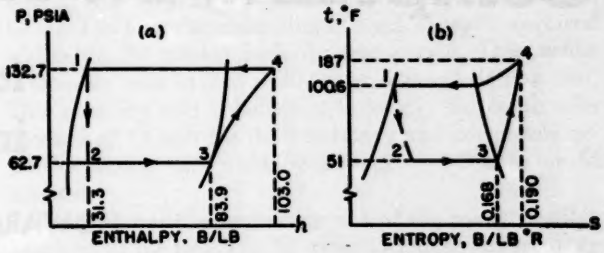


Fig. 9. Refrigeration cycle for a test of short duration. Refrigeration cycle on the pressure enthalpy plane is shown at "a" and at "b" on the temperature entropy plane.

The heating energy ratio of the refrigeration cycle, Fig. 7, at the end of the test, assuming polytropic instead of isentropic compression is given by the equation

$$HER = \frac{h_4 - h_1}{\frac{W_{3\text{-}4}}{J}}$$

The heat absorbed by the F-12 during compression is given by

$q_{3\text{-}4} = \frac{1}{2}(522 + 842)(0.232 - 0.167)$ Btu per lb
= 44.3 Btu per lb

Using the steady flow equation,

$$h_3 + q_{3\text{-}4} + \frac{W_{3\text{-}4}}{J} = h_4$$

$$\text{then, } 85.0 + 44.3 + \frac{W_{3\text{-}4}}{J} = 137.3$$

$$\frac{W_{3\text{-}4}}{J} = 8.0 \text{ Btu per lb}$$

$$\text{then, HER} = \frac{h_4 - h_1}{\frac{W_{3\text{-}4}}{J}}$$

$$= \frac{(137.3 - 36.2) \text{ Btu per lb}}{8.0 \text{ Btu per lb}}$$

$$= 12.6$$

Causes for Pipe Insulation Failure

Insulation maintenance is a neglected factor in many plants and often leads to costly heat losses or operating inefficiencies, according to The Magnesia Insulation Manufacturers Association which points out that the need for maintenance may result from normal wear and tear, from failure to repair or replace insulation damaged or removed during alterations, or from routine equipment maintenance work.

Most frequently, the need for insulation repair on pipe lines can be noticed around flanges and fittings which are opened for inspection or other purposes. Pipe insulation adjacent to chain hoists, doors or other moving objects may be damaged if not properly protected. Loose tie wires or bands and damaged canvas covering should be checked and repaired. Small fittings insulated with cement are more likely to need periodic reinsulation than pipes and larger fittings having molded insulation.

Equipment is likely to show most need of insulation repair around manholes or other openings where the edges are subject to hard contact and abrasion. Vibrating or rotating equipment, when insulated, should be checked frequently to assure the soundness of the fastenings. Loose tie wires or sheared stud welds may allow the insulation to sag or perhaps to become completely detached.

One of the factors causing neglect of insulation maintenance, it is stated, is the need for stocking insulation materials of various types and sizes such as blocks, pipe sections, cement, canvas, wires and bands. This problem can be solved by arranging with an insulation contractor for periodic inspection and maintenance. Plants using such service, it is said, find that it more than pays for itself through prolonged life of the insulation and added fuel savings.

Computing the Hot Water Demand

for the washroom facilities installed in an industrial plant

HOWARD S. MOLK

Mechanical Engineer, Gibbs & Hill, Inc., New York, N. Y.

By the use of a number of illustrative design problems, methods are shown for calculating the hot water demand and the required capacity of a hot water storage tank, where one is required.

THE calculations of hot water requirements for the wash room facilities of an industrial plant should be based upon the peak loads which occur at each change in shifts. For a plant in operation 24 hours each day, this peak will occur at 8-hour intervals and will be approximately 30 minutes in duration. A safe estimate of the hot water requirements may be based on the following assumptions:

(1) One man requires about 15 minutes to take a shower.

(2) One man requires about five minutes to wash at a basin or wash fountain.

(3) A man will use a shower if it is immediately available, that is, he will use it if he does not have the inconvenience of waiting for more than a few minutes.

Using these assumptions will result in a safe estimate since the showers, which require the largest amount of hot water, are assumed to be in use continuously during the peak load period.

The application of the above assumptions will now be illustrated in the following typical cases:

Let L = number of basins (in the case of a wash fountain use an equivalent number of basins)

S = number of shower heads

M = number of men

Case 1—The number of men is less than the number of shower heads. Then, *M* showers will be in continuous use for 15 minutes.

Case 2—The number of men is greater than the number of shower heads, but less than the number of shower heads and basins combined. Then, *S* shower heads will be in continuous use for 15 minutes, and only M-S basins will be in continuous use for five minutes.

Case 3—The number of men is greater than the number of shower heads, and greater than the number of shower heads and basins combined. This case may be again broken down to two more cases as follows:

Case 3A—The number of men is greater than the number of shower heads, but less than the number of shower heads plus three times the number of basins. (Note: Three men can wash at a basin in the time it takes one man to take a shower.) Then, *S* showers will be in continuous use for 15 minutes, and *L* basins will be in continuous use for [(M—S)/L] x 5 minutes.

Case 3B—The number of men is greater than the number of shower heads, and greater than the number of shower heads plus three times the number of basins. Then, *S* shower heads and *L* basins will be in continuous use for 15 minutes. After the first 15 minutes M—(S+3L) men will still be waiting to wash. This remaining group will then fit into one of the above cases and be treated accordingly.

Once having obtained the number of fixtures and the respective intervals of continuous use, it is a simple matter to convert to gallons of hot water required. From the "Report of the Coordinating Committee for a National Plumbing Code—1951", the following figures are given for the rates of flow for various fixtures:

Ordinary basin faucet, 3 gpm
Shower head, 5 gpm

These quantities represent total flow for the fixtures and the hot water flow may be taken as ¾ of the total, or

Ordinary basin faucet, 2 gpm
Shower head, 3½ gpm

The actual number of gallons of hot water required may then be obtained by multiplication of the number of fixtures used, the interval of continuous use, and the rate of flow.

In addition to the peak load demand there may be an intermittent demand and/or a continuous hot water demand for certain plant equipment. The following is given as an example:

Problem:

An industrial plant is in operation 24 hours per day. Each shift requires 35 men. The wash room facilities include three showers, three basins, and a 36-inch wash fountain. The plant includes a laboratory for which there is a continuous demand of 12 gph of hot water. Find the amount of hot water required and the capacity of the hot water storage tank.

Solution:

In setting up the problem, the wash fountain is replaced by an equivalent of three basins. Thus:

M = 35; S = 3; L = 3 + 3 = 6.

It is evident that this is the condition covered by Case 3B. Therefore, three shower heads and six basins are in continuous use for the first 15 minutes. After this period, M—(S+3L) = 14 men, the number still waiting to wash. This condition is covered by Case 3A. Therefore, three shower heads are in continuous use for fifteen minutes and six basins are in continuous use for [(M—S)/L]x5 =9 min. In all, the three shower heads are in continuous use for 30 minutes and the six basins are in continuous use for 24 minutes. The hot water required is then:

Shower heads = 3 x 30 x 3½ = 315 gal
Basins = 6 x 24 x 2 = 288 gal

Total = 603 gal

Use 600 gal for the figure.

If a storage tank having a capacity of 75% of the total demand is chosen, then:

Storage tank capacity = 600 x 0.75 = 450 gal

Since only about 75% of the capacity of the tank may be withdrawn before the incoming cold water excessively cools the hot water stored, only 340 gal of hot water is immediately available. The heating element must then be sized to heat the remaining 260 gal of water required within the 30 minute peak demand period. This means a recovery rate of 260 x 60/30 or 520 gph is required. This recovery rate is sufficient to supply the continuous demand of 12 gph for the laboratory and completely refill the storage tank in 450/520—12 = 0.9 hour or 54 minutes.

The previous choice is only one of the many possible solutions to the problem. In order to reduce the recovery rate, a storage tank may be chosen that is capable of supplying the total demand immediately. This is done as follows:

Storage tank capacity = 600/0.75 = 800 gal.

The recovery rate is then chosen to refill the tank within eight hours while supplying the continuous laboratory demand of 12 gph.

Recovery rate = (800/8) + 12 = 112 gph.

Hosiery Mill Controls Its Air Conditions

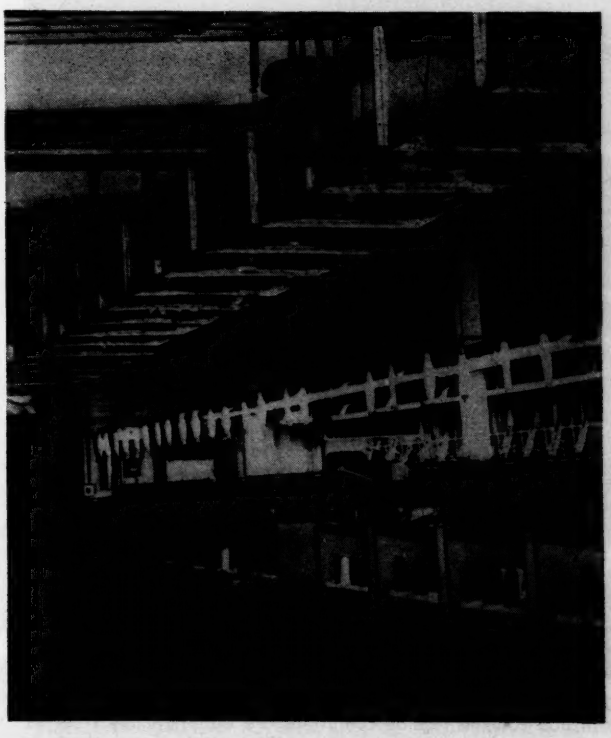
Hoburt Mills, a medium-sized full fashioned nylon hosiery mill, located in Denton, N. C., has facilitated production through the installation of a Typhoon 20-ton air conditioning unit. A humidifier operating with the unit keeps humidity within rigid limits.

At the Hoburt Mills there are six full fashioned hosiery machines, each about 58 feet long, with needles spaced 68 to the inch. Each electronically operated machine handles 32 stockings at a time and is a complex mass of moving parts. A variation of a few degrees along the length of the machine would cause a deflection, break needles, snap yarn, and thus make the machine inoperative, with a consequent loss of man hours, material, and time. Variations of more than a few percentage points in humidity could be equally disastrous. This knitting mill is approximately 90 ft long and 60 ft wide. Cool, humidified air from the air conditioning unit is distributed through a 48-inch x 18-inch duct running lengthwise through the plant, with side grilles and circular diffusers to assure even distribution. A 20-ton Typhoon evaporative condenser located on a covered loading platform outside the plant cuts water consumption over 95%.

Additional cooling is derived from a spray system on the roof, which reduces the high solar heat load. The inside conditions maintained are 80F dry bulb with 55% relative humidity when outside dry bulb is 95F and wet bulb is 76F. The unit allows a tolerance of only 2% in relative humidity, and the equipment is large enough to allow for an expected addition of two more knitting machines.

Besides the knitting area, the seaming operation and the company's offices are also cooled by the same unit through a branch duct. The mill owners report that employee morale is considerably higher since the installation of the air conditioning, and point out that summer discomfort was one of the major complaints made by employees in the past. Fewer of the workers were reported absent.

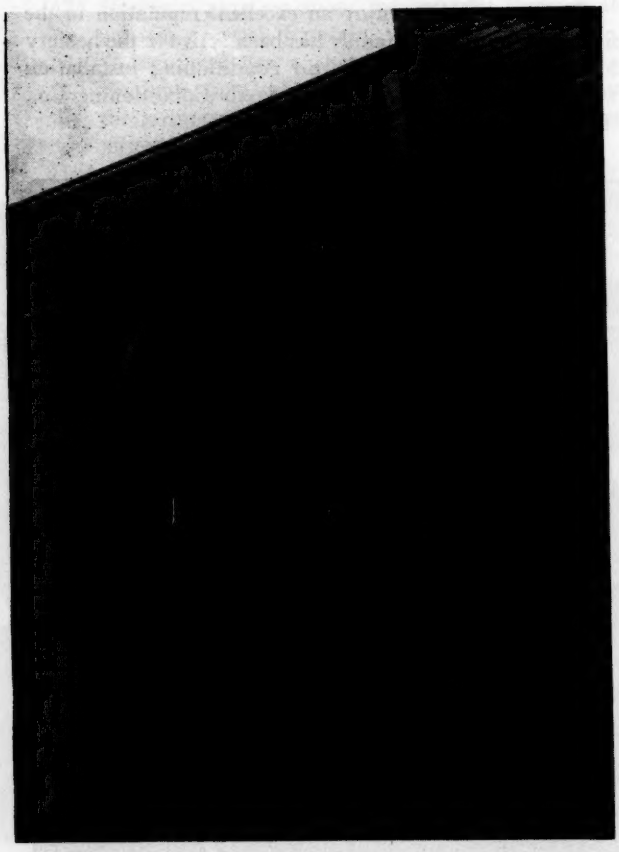
The Hoburt Mills enjoy an excellent reputation in the field, and the Barusch family has been active in the hosiery business for 55 years. The air conditioning installation was made by the Gray Heating & Air Conditioning Co., High Point, N. C.



Packaged air conditioning unit serves hosiery mill.

Heating contractor Joseph Courter's attractive 9-room modern Georgian style house in Essex Fells, New Jersey, is divided into five heating zones.

Heating a Five-Zone House

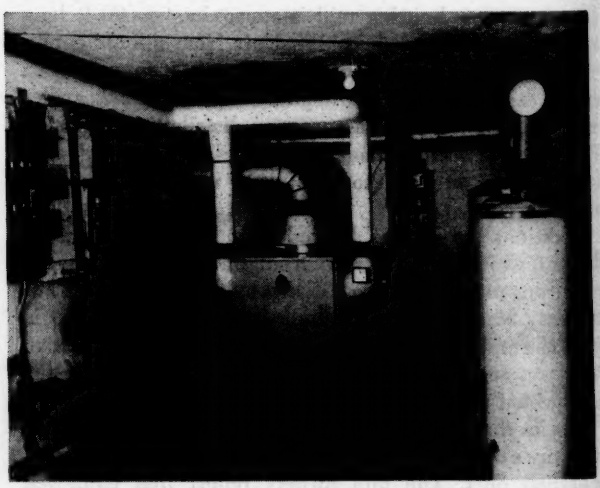


Outdoor control, called anticipator, signals temperature changes to inside controls. Inside conditions are automatically reset to compensate for new temperature differential. Hence there is no lag in the system.

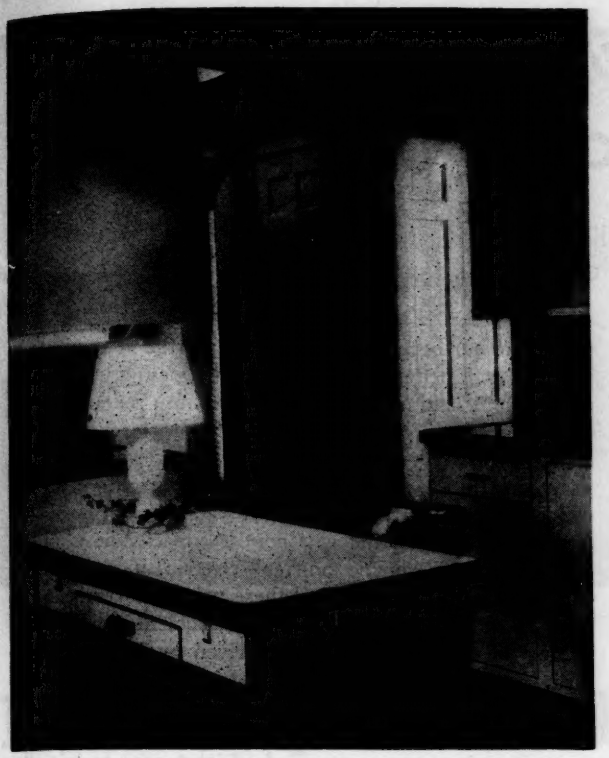
A heating system designed to fit his family's living habits has enabled heating contractor Joseph Courter, of Courter & Company, Inc., New York, to achieve virtual mastery of indoor temperature conditions in his modern Georgian, two story home in Essex Fells, New Jersey.

A gas-fired, hot water ceiling and floor panel system heats the 9-room and basement house which is itself divided into five heating zones, each individually-controlled.

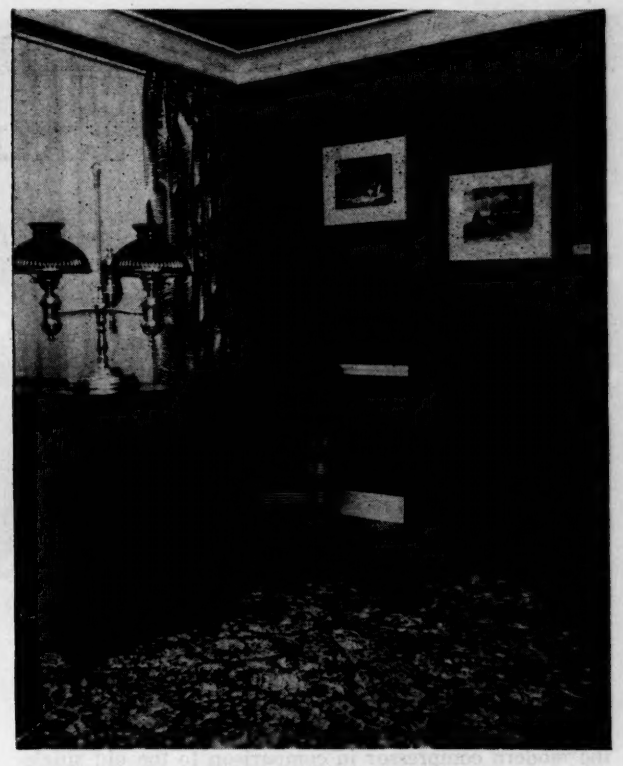
The decision to zone the heating system of the house was based on several factors. For one thing the Courters



Heart of the Courter's gas-fired heating system. Pictured are four of the five circulators, gas-fired hot water boiler, and three hot water tanks for domestic hot water, laundry and dishwasher, and the snow melting system.



The kitchen area is a heat zone by itself with separate thermostat located between the two doors.



A space thermostat placed in the den modulates the temperature in the first floor heating zone.

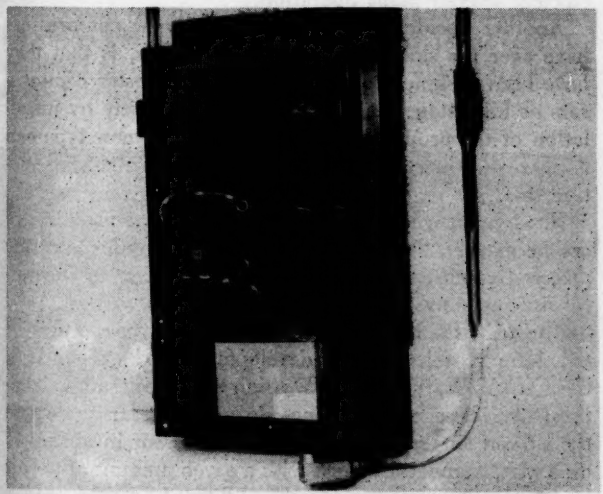
preferred somewhat higher temperatures in their bathrooms than they did in their bedrooms. Second, they decided that the kitchen would need a separate control to compensate for the heat of the cooking appliances. Third, the basement recreation area heat needs would undoubtedly vary with its use and occupancy. And last, they wanted a system that would keep the downstairs area comfortable when they had guests; yet at the same time provide cooler temperatures in the bedrooms of their two teen-aged boys.

The five individually-controlled zones do the job and do it economically, Mr. Courter says. Three zones are controlled by Minneapolis-Honeywell's electronic moduflow system. The basement (the only area using radiant floor panel heating) and the garage are on one zone. The kitchen is a zone by itself. The remainder of the first floor—the hall, study, powder room, dining room and living room—are another zone. The three upstairs bathrooms comprise one zone and the four bedrooms—the two boys' rooms, the master bedroom and the guest room —round out the last zone.

Electric clock thermostats in the master bedroom and the dining room provide day-night automatic control.

An outside anticipator keeps check on weather changes for the three zones which are controlled electronically—the first floor, bedrooms, and basement-garage zones. During the first winter's operation, Mr. Courter found the control for the water temperature in the hot water boiler was not sensitive enough. While the outside anticipator was operating the circulators correctly, the water temperature was slow in building up. Installation of one of Honeywell's new hot water reset controls outside the house, on the North wall, like the anticipator, gave equally sensitive control to the hot water. The hot water reset, he explained, has a 1½ to 1 ratio, or in other words, a 1½-degree outside temperature drop will result in a 1-degree water temperature change.

Domestic hot water is maintained at 140F; for laundry and dishwasher, 180F; and for snow melting (on the driveway), 110F. The gas-fired hot water boiler which provides the hot water for the heating system, is capable of producing 360,000 Btu per hr. Mr. Courter, whose firm specializes in industrial contracts, designed the heating system in collaboration with Minneapolis-Honeywell engineers. Alfonso Alvarez, Jr., of Montclair, N. J. was the architect and Carlson & Johnson the builders.



The brains of the Courter five-zone heating system. The three large boxes with the protruding tubes are the electronic relay amplifiers for the three heating zones that have moduflow control.

High Speed Ammonia Compressors Show Extra Savings

A. R. DAVIDSON
Sales Engineer, York Corp., York, Pa.

USE of high speed ammonia compressors means added economy. These multi-cylinder compressors, currently manufactured by a number of major air conditioning and refrigeration firms, are commonly referred to as V/W, V, Y and W type compressors because of the alignment of the cylinders.

They are a sharp contrast to the old familiar single-acting vertical machines of slow and medium speeds and of comparatively heavy construction. Its development has been spurred on by ever-increasing costs and shortages of many basic materials, and the manufacturers' continuous search for products that will better suit the users' requirements. The modern compressor is a product of many years experience and research.

The customer receives better value when he invests in the modern compressor in comparison to the old single-acting vertical machine. The reasons are many, but the most important features will be mentioned.

The V/W, V, Y and W type compressors are lighter and smaller, and this means therefore, less basic material is used for a given job. However, the greatest value to the user is the lower freight charges and lower cost of installation; they take up considerably less space. Excessive head room is no longer required because most of these machines stand no more than waist high. Gone are the days of having to build machine rooms with excessively high ceilings or to provide holes in upper floors to permit removal of pistons from large compressors.

Definite savings accrue to the user because of higher rotative speeds, lighter weight, better balance, smaller parts, and the fact that every part subject to wear is replaceable. Heavy foundations and footings are no longer required, and upper floor installations are possible and practical. The compressor is easily moved into place and can be just as easily moved to new locations. What about these smaller parts? Should a breakdown occur, these smaller, lighter, less costly repair parts can easily be flown to even remote locations without excessive charges. Since parts have been standardized in size and type, cost is low and physical dimensions are small. These parts can be stocked adequately at many points throughout the country to permit a better and more rapid service.

By comparison with the older types, the new units really are speedy. We talk now of speeds from 700 to 1,150 rpm as compared with the older machines' 250 to 400 rpm. Actually though, these speeds are quite conservative for modern reciprocating machinery. We think nothing of driving our automobile hour after hour with the engine turning over 3,000 to 4,000 rpm. Then there are gas and diesel engines which run on a round-the-clock basis with speeds in the 1,000 to 2,000 rpm range.

The piston speeds in these new machines are in many cases no greater than the older, slower machines because the stroke has been shortened and by virtue of the lighter weights and better balance of reciprocating parts, the stresses and strains, if anything, have been reduced.

Experience shows modern compressors are definitely standing up well and showing no greater wear than we have come to expect from the old line of machines. Speed which permits the lighter weight and smaller size also gives us drive advantages. Compressors can be coupled directly to the prime mover—electric motor, diesel engine, or steam turbine and these prime movers can, in turn, be of lighter weight and more efficient machines.

Most of our compressors are driven by induction motors. In the old machines, we had to furnish high torque motors and many times, motors of greater horsepower rating than was required for normal operation of the compressor because we required a high torque to initially start the machine, especially on automatic operation. Now with the new high speed compressors, by virtue of their lighter weight and automatic unloading of the cylinders, it is possible to utilize normal or low starting torque motors of no greater horsepower rating than actually is required for operating the compressor. This reduces first cost of the equipment and affords a continuous saving in power.

In addition, these machines are equipped with means for either manual or fully automatic reduction of capacity by unloading the various cylinders, or groups of cylinders. This permits manual or fully automatic matching of the compressor's capacity to the load, and maintenance of operation at the most economic level. With this better balance of compressor to load, comes more efficient overall plant operation.

Another decided advantage that the new compressors have over the slower single acting verticals, is that they have been designed to be used either as booster compressors or high stage machines. Therefore, merely by installation of the proper valves and piping, the new type can be used on low suction as a booster, or on the high suction line.

Though these new machines are of recent prominence on the market, they merit the complete confidence of the prospective customer because they have been in successful use in many thousands of installations.

The points and advantages reported are only a few of the main reasons for the development and existence of the new V/W, V, Y and W high speed ammonia compressors. These new machines do not necessarily surpass the slower, single acting vertical compressor in ability to do a given amount of work with a given amount of power but they do provide greater flexibility of operation, take up less space, lower the cost of operation and maintenance, and of equal importance, reduce the cost for original installation.

Full-scale model of the cabin section of the Boeing B-47 Stratojet used for testing an air-moisture separator.

Humidity Control in Plane Cabins

The modern jet airplane, which can fly in a few minutes through the hot air near the earth's sun-warmed surface to cold air at high altitudes, has imposed a new problem in cabin air conditioning which the Boeing Airplane Co. has recently been able to solve.

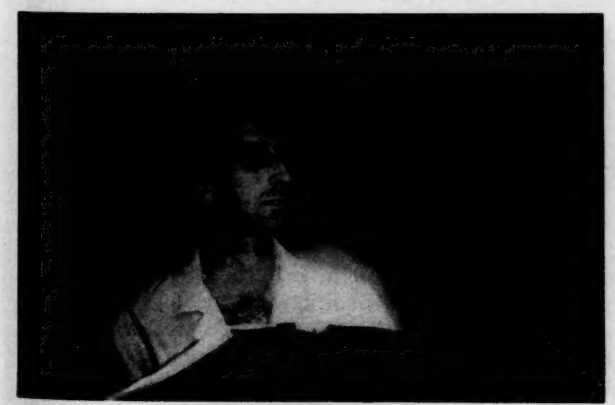
RAY BLOOMBERG

Seattle, Wash.

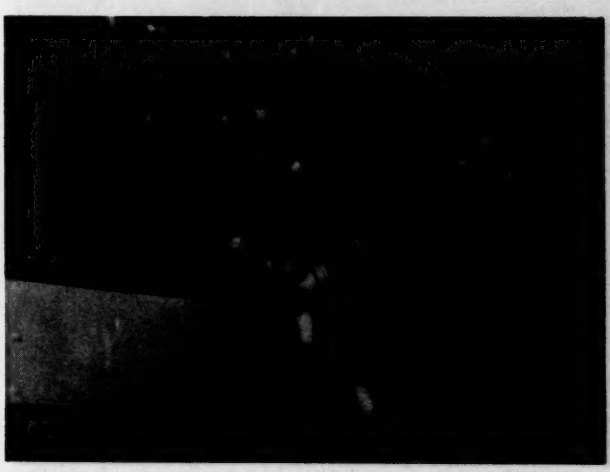
UNDER certain conditions, Boeing engineers found that large quantities of snow, ice, water, and fog were expelled from the air-conditioning vents of pressurized airplane cabins. The most potentially-serious condition existed when large quantities of water were expelled, literally in streams, from the vents and accumulated on various electrical connections, relay boxes, etc. Water would run down the windshield to such an extent that vision was impaired, resulting in hazardous landing conditions and leading to the suggestion that windshield wipers be installed on the inside.

A particularly annoying and dangerous condition sometimes occurred when, usually after landing, the air in the cabin flashed instantaneously into thick fog. This was caused by a combination of chilled cabin structure, the introduction of warm, moist air, and a rapid rise in cabin pressure. These factors quickly raised the cabin dew-point temperature to that of its dry-bulb temperature. At the instant the two temperatures became equal conditions were just right to form a cloud inside the cabin.

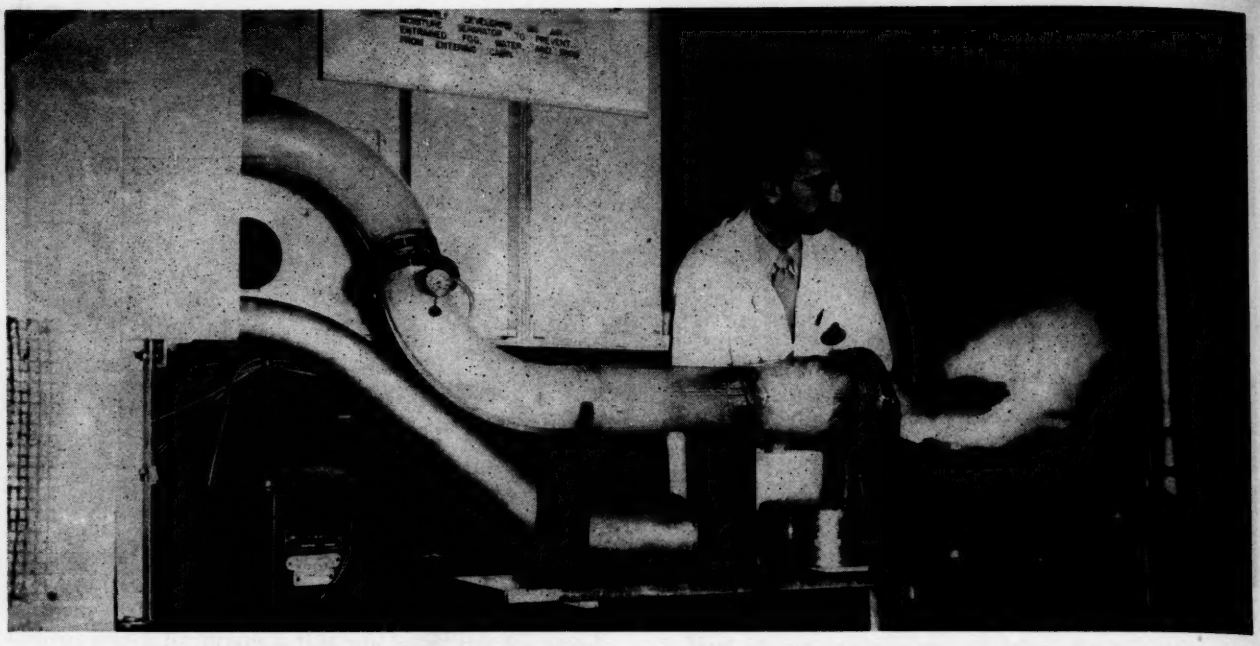
To solve the problem, Boeing set up a full-scale model of its six-jet B-47 cabin in a laboratory and used com-



Fog coming from the air conditioning system. When the separator was used, the fog disappeared.



Under certain conditions, ice would break out of the air-duct and shower into the cockpit.



Air emerging from the separator still has some fog in it but this quickly disappears. Bob Walter, Boeing engineer who developed the separator, here supervises a bench test.

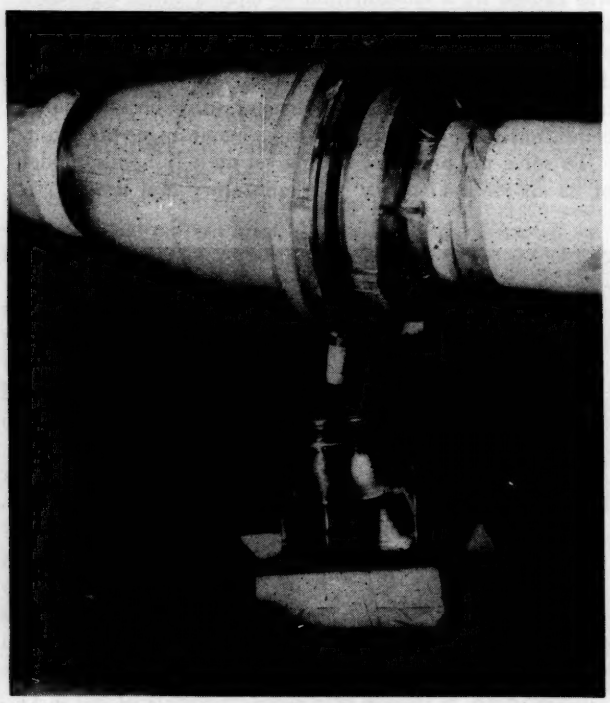
pressed air and steam to simulate conditions of both an Air Force summer day and a National Advisory Committee for Aeronautics standard day.

Values of these days at sea level are as follows:

NACA standard day: Outside air temperature, 59F; relative humidity, 100%; moisture content, 75 grains of water per pound of dry air.

AF summer day: Outside air temperature, 100F; relative humidity, 33%; moisture content, 100 grains of water per pound of dry air.

Both these days are standard aeronautical design days



Before moisture-laden air enters the cabin, water is drained out through the separator.

through the central United States, through the central Pacific, in the Philippines, the Mediterranean, Borneo and northern Australia.

The problem with the jets, Boeing knew, was that too much moisture was entrained in the air drawn from the outside and blown into the cabin. If it could take that moisture out of the air before it reached the cabin, the problem would be solved.

Air-conditioning systems of high-altitude airplanes use compressed air in their cabins, in order to maintain near-sea-level pressures when climbing to rarefied heights. The heat generated in compressing this air is a problem, necessitating the use of air coolers so that the cabin temperature can be held at a comfortable level. As performance of aircraft is increased, the relative values of pressurization and cooling likewise increase, and this aggravates the condensation problem.

Boeing determined that a centrifugal water separator, with an impeller consisting of a cone-shaped hub with spiral vanes, was the best type for a jet airplane. A cyclonic rotor is attached to the impeller. Whirling inside a duct, the vanes deflect the onrushing air and literally throw the entrained water onto the inside surface of the duct.

Added to the separator is a trap for catching the water after it has been thrown to the inside surface of the duct, and leading it away. The entire assembly weighs only four pounds, the rotor only ten ounces.

This separator has been found to be 80% efficient, which is all that is necessary, at temperatures no colder than 33F. Under most high-humidity conditions, the air gets no colder than this. In some high-performance airplanes, however, air-conditioning-system pressures are quite high and this circumstance, accompanied as it is by greater expansion as air flows through the separator into the cabin, will produce lower duct temperatures and cause ice to form. Boeing now is working on the answer to this problem.

Locating Bus Air Intake

GEORGE M. HAMA

Bureau of Industrial Hygiene, Detroit Department of Health, Detroit, Mich.

Tests on busses indicate that fresh-air intakes must be high above street level to prevent contamination from exhaust gases of other vehicles.

IN a recent study of bus ventilation, it was found that in addition to offensive odor contamination from oil vapor and products of combustion from the bus engine, noxious odor contamination from outdoor sources through the fresh-air intakes also took place. Exhaust gases are discharged into the street by other motor vehicles. These gases are picked up by the fresh-air intakes of the busses and cause irritation and discomfort to the passengers. Trucks and busses are especially bad offenders in discharging noxious gases. These gases have been shown to contain carbon dioxide, carbon monoxide, hydrogen, nitrogen, oxygen, methane, water vapor, oxides of nitrogen, aldehydes, sulfur compounds, lead compounds, and other materials.

Several types of fresh-air intakes are commonly used on busses. Fig. 1 illustrates an intake that takes in fresh air about 4 ft. above the ground level in the front portion of the bus. A modification of this type of inlet is a side intake which is about 4 ft. from ground level and near the rear door of the bus. Fig. 2 illustrates a high fresh-air intake above the windshield of the bus. These intakes are about 8 or 9 ft. above the street level. They are considerably above the general traffic level.

There was some question as to whether a high air intake resulted in less contamination than the lower fresh-air intake. It was thought that the higher fresh-air intake would be preferable because the air was taken in at a point considerably above the general traffic level where the wind could effect dilution. In order to decide this question, it was decided to run simultaneous tests at the high and low intake points under actual operating conditions in city traffic. The high and low points were respectively 8 ft and 4 ft above street level, in the front of the bus. Inasmuch as carbon monoxide and aldehydes are important air contaminats in the exhaust gases of motor vehicles, it was thought that a test for these materials would indicate the degree of contamination of the air. The determination for carbon monoxide were made with two supersensitive direct reading carbon monoxide indicators which had been carefully calibrated. The tests were made during an actual city bus run in various traffic conditions. The readings from the high and low points were taken simultaneously. On the day of the test, the wind velocity varied from 2 to 4 miles per hour. Results of the tests for carbon monoxide are as follows:

Bus with air intake at front of roof.

Carbon Monoxide in Per Cent by Volume

Conditions	*High Intake*	*Low Intake*
(1) Medium traffic conditions.....	.0000	.0020
(2) Medium traffic conditions.....	.0005	.0025
(3) Heavy traffic conditions.....	.0010	.0030
(4) Heavy traffic conditions.....	.0015	.0035
(5) Very heavy traffic conditions...	.0020	.0040

The tests for aldehydes were made during a test run directly behind a Diesel-powered bus. (The Diesel-powered bus was selected because its exhaust gases are relatively high in aldehydes.) The air samples were absorbed in a gas bubbler and were analyzed in the laboratory by a colorimetric method, using Schiff's reagent. Two samples were taken simultaneously at the high and low-intake points. Results of these tests are as follows:

Aldehydes Expressed as Formaldehydes in Parts Per Million Parts of Air

Conditions	*High Intake*	*Low Intake*
10 to 20 ft behind Diesel-powered bus	.07	.20
5 to 10 ft behind Diesel-powered bus	.10	.28

The above tests indicate that the higher intakes result in less contamination than the lower intakes and that the higher intake is preferable for fresh air supply to the bus. The maximum allowable concentration for carbon monoxide for an 8-hour exposure is .01% by volume. The maximum allowable exposure for aldehydes expressed as formaldehyde is 5 parts per million parts of air. However, tests have been indicated that concentrations of aldehydes from exhaust gases of internal combustion engines are extremely obnoxious and irritating in concentrations as low as 0.1 of a part per million parts of air.

Theory vs. Practice in

Radiant Heating

T. NAPIER ADLAM

Vice-President, Sarco Manufacturing Co., and Technical Director, Sarcotherm Controls, Inc.

Part 4 of a six-part article. For concrete floors in multi-story buildings, it is important to calculate the conductance through floor and floor coverings, as well as to consider the heat flow downward from the floor above. A design procedure is presented for several floor and ceiling conditions.

WITH many types of fabricated wood floors it is invariably found possible to introduce a very effective layer of insulating material between the joists to retard the heat from passing downwards, and thereby obtain the desired results. However, with solid floors using concrete or other similar medium, it is often necessary to calculate the conductance of the structure to ensure a good job. Therefore, it may be of interest if I describe the method I usually employ and recommend, to deal with such a problem in connection with large apartments and other similar buildings.

Rooms in Apartment Building

Let us assume we have to deal with an apartment building where ceiling panels are to be employed throughout, and that we are considering a typical room where the total heat losses from the room are equivalent to 64 Btu per sq ft emission, if heat is coming from the ceiling area alone. It is necessary to consider what heat emission may be expected from the floor into the same room, due to the conducted heat from the ceiling coils below, because heat entering the room from the floor or any other course, should be subtracted from the estimated heat requirements from the ceiling. Under normal conditions, I usually allow for 10 to 15% of an average floor load, providing the insulating medium necessary to achieve these results is not too expensive. Therefore, if we take 10% of 40 Btu per sq ft per hr, which is the normal output from floors under average conditions, we have 4 Btu per sq ft from the floor, which allows us 64 minus 4 or 60 Btu per sq ft required from the ceiling. It is assumed that the ceiling area is the same as the floor area. If now we next refer to Fig. 15, reproduced from Fig. 248, page 371 of Radiant Heating, second edition, we find at point *C* that for 60 Btu per sq ft of ceiling surface, we require a surface temperature of 105F.

Pipe Sizing and Spacing

Having ascertained that a surface temperature of 105F is required for the ceiling, we use Fig. 16 to obtain data concerning the size and spacing of the pipes. Fig. 16 was prepared for pipes 1½ inches above the ceiling surface, for condition where carpet was placed over a felt or foam rubber mat, and was devised for an actual installation. The maximum recommended mean temperature of circulating water is 130F but for the special example, it is assumed to be 125F. By using the usual procedure with these charts, we follow the heavy line *A B C D* where *A* is the total load or 64 Btu. For the purpose of ascertaining the amount of pipe surface required, we have to consider the total amount of heat which passes in both directions, neglecting any small amount of heat which may be transmitted sideways. (If we are dealing with an outside room and especially a corner outside room, then it is often advisable to add something for the loss of heat conducted sideways to the main outside walls.)

Since point *D* represents ¾-inch iron or steel pipes on 9-inch centers, we proceed as follows:

Fig. 17 illustrates a cross-section through a typical floor having a concrete slab 8 inches thick. Although the ¾-inch pipes are, in this case, placed 1½ inches above

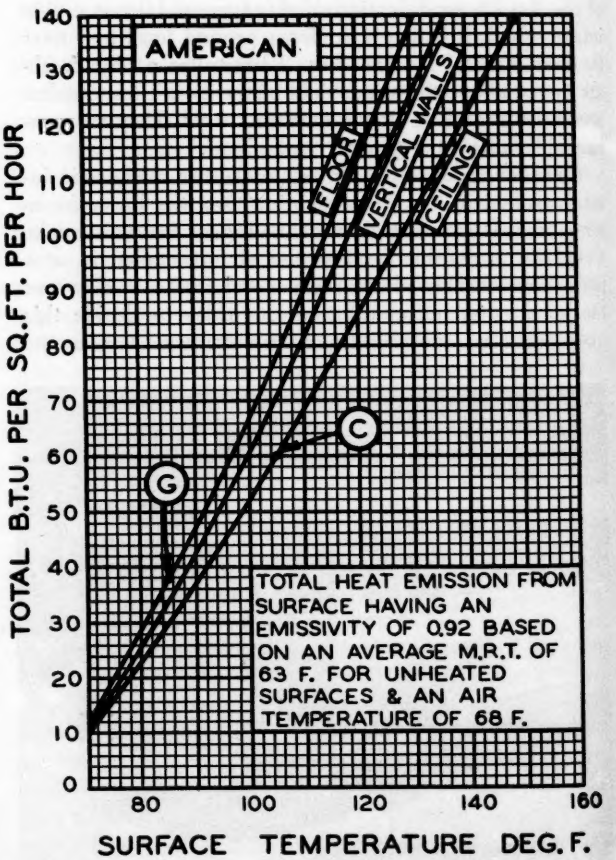


Fig. 15. Total heat emission from heated panels according to location, for average American conditions.

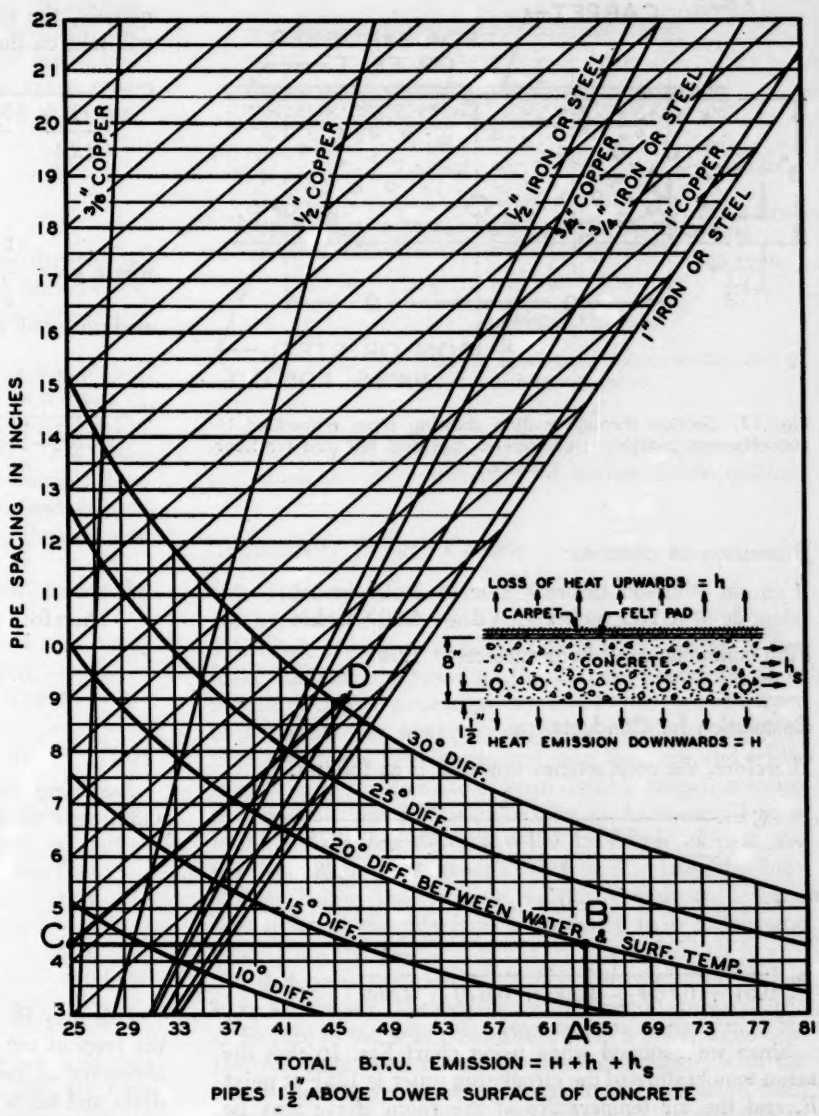


Fig. 16. Chart for determining size and spacing of pipes for a room with concrete ceiling and carpet on floor as illustrated.

the ceiling surface, this distance may be made more or less as considered desirable. Since the floors of apartments may be covered with carpets, asphalt tiles, or other material depending on the purpose for which the rooms are to be used, it is generally considered good practice to have a layer of low conductivity material placed on top of the concrete slab before the finish flooring is applied. In this particular problem, carpets are to be used and I have indicated a felt pad below the carpet, although it is now becoming a general practice to use sheet foam rubber below carpets instead of a felt pad since this material is softer and the conductivity is generally slightly greater than the customary felt pads.

Heat Transfer Through Mats

I believe, however, that it is expedient to suggest that before using rubber mats below carpets, the question of moisture should be considered as under some conditions this may prove to be a serious problem. The greater conductivity of foam rubber offers no advantage in this particular application, since we wish to retard the heat, but it is often considered preferable where floor heating is applied and carpets are to be used on the heated floors. To ascertain the amount of heat which travels upwards to the floor above with this type of construction, we can obtain a very close approximation by using the same method of calculation described for problem 12 on page 265 of Radiant Heating. Since dimensions shown in Fig. 17 represent comparable dimensions to those shown in the book's Fig. 145, the method on which the calculations are based may be easily followed.

Let us assume we wish to first ascertain what results we may obtain without the introduction of a non-conducting medium, and assume there is a felt pad under the carpet which, to some extent, will retard the heat upwards. Hence to calculate the conductance upwards, using values for *k* and thickness of the various materials as given below, we proceed as follows:

Material	k	Thickness
Concrete	9.00	(See dimensions page 80)
Felt	0.25	1/8 or 0.125 inch
Carpet	0.28	3/16 or 0.1875 inch

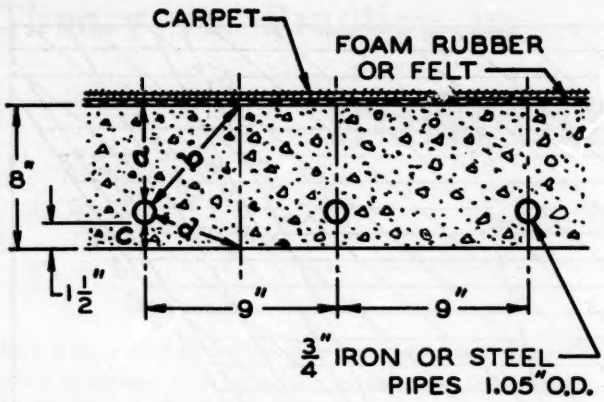


Fig. 17. Section through ceiling showing pipes embedded in concrete—no plaster on ceiling—carpet and felt pad for floor above.

Dimension of concrete:

a = 5.450 inches c = 1.500 inches
b = 6.955 inches d = 4.409 inches

Film conductance of floor surface = 1.64

Calculation for Conductance

Therefore, the conductance upwards is as follows:

$$C = \frac{1}{\frac{1}{1.64} + \frac{5.45 + 6.955}{2} + \frac{0.125}{9} + \frac{0.1875}{0.25} + \frac{0.1875}{0.28}} =$$

$$\frac{1}{0.61 + 0.689 + 0.500 + 0.670} = \frac{1}{2.469} = 0.405$$

Since we assumed when using chart Fig. 16 that the mean temperature of the circulating water is 125F at point *B*, and the air temperature of the room above may be taken as 70F, we have a temperature difference of 125 — 70 = 55F. Consequently, the heat passing upwards under these conditions = 55 × 0.405 = 22.27 Btu per sq ft per hour. This, however, is much more heat than we desire from the floors; with 60 Btu per sq ft from the ceiling, it would put a greater load on the ceiling coils than we had estimated.

However, as our main objective is to have a low emission from the floors, we approach the problem from the point of view that we require only 4 Btu per sq ft to pass upwards, and in consequence, we must introduce an insulating medium in the floor as shown in Fig 18. To limit the heat conducted upwards to 4 Btu per sq ft per hr where we have a temperature difference of 55F, the conductance should be

$$\frac{4.0}{55} = 0.0727.$$

In this instance I have suggested vermiculite because of its comparatively low price and its low conductivity. However, since vermiculite is somewhat softer than concrete, it is not considered the best surface for hard wear. Therefore, it was advisable to apply a cement finish about ¾ inch thick, having a conductivity k = 12.0. Consequently, the new equation for the conductance upwards will take on the form:

$$C = \frac{1}{\frac{1}{1.64} + \frac{5.45 + 6.955}{2} + \frac{0.125}{9} + \frac{.1875}{0.25} + \frac{0.1875}{0.28} + \frac{0.75}{12} + y} = 0.0727$$

where $y = \frac{t}{z}$, t being the thickness of the insulating medium, and z the conductivity, consequently,

$$C = \frac{1}{.610 + .689 + .500 + .670 + 0.0625 + y} = 0.0727$$

$$C = \frac{1}{2.531 + y} = 0.0727$$

Therefore $(2.531 \times 0.0727) + 0.0727\ y = 1$

$$.0727\ y = (1 - 0.1840) = 0.816$$

$$y = 11.23$$

Assuming we use vermiculite with a conductivity of 0.32, then we have

$$\frac{t}{0.32} = 11.23$$

or t = 3.51 inches

This may be considered too expensive, or it may raise the level of the floor too much, in which case it may be necessary to reduce the thickness of the insulating medium and allow a larger amount of heat to pass upwards through the floor. For instance, if we assume 15% which is 6 Btu per sq ft per hr, as being permissible instead of 4 Btu, we find that by using 6 Btu instead of 4 Btu in the previous calculations, we are able to reduce the thickness of the insulating layer to 2.12 inches.

This compromise may affect the temperature of the circulating water very slightly and therefore can be considered as relatively unimportant since it is deemed good practice to insert a balancing fitting in each coil for making final adjustment of temperatures after the system is in operation.

If it is desired to use foam rubber under the carpets (carpet normally has a thickness of 5/32 to ¼ inch, and generally a *k* value of approximately 1.4 Btu), the conductance upward will be slightly greater, but we may compensate for this by using an extra thickness of vermiculite. This complete problem was taken from an actual example and in this particular job, no plaster was required on the ceiling, although it is a simple matter to allow in the calculation for plaster or any other ceiling covering, if so desired. The vermiculite layer was actually applied 2.15 inches thick as shown in Fig. 18.

Any other suitable insulating medium of known conductivity may be used and the thickness calculated in a

similar manner. An air space can, of course, be formed in the structure to retard the heat passing upwards, but often the heat conducted through the material supporting the upper slab outweighs the value of the air space, especially if no high reflecting film is placed on the upper and lower surfaces of the air space.

Suspended Ceiling Design

However, it may be of interest to consider the case of a typical suspended ceiling application which came before me recently where the suspended ceiling was used as the heated panel, as illustrated in Fig. 19.

In this case the ½-inch bore copper tubing was placed on 6-inch centers, with ¾-inch plaster above the top of the copper pipe which gave an average distance for the heat to travel: $(a + b \div 2) = 1.81$ inches. Cork slabs 2 inches thick were supported below the concrete floor to retard the heat flow to the floor above, and in this case the felt pad was laid down directly on the concrete surface.

Using factors as before with the conductivity for the plaster k = 3.5, we have:

$$C = \frac{1}{\frac{1.81}{3.5} + \frac{1}{1.1} + \frac{2}{0.34} + \frac{6}{9} + \frac{0.1875}{0.25} + \frac{0.1875}{0.28} + \frac{1}{1.65}}$$

The conductivities and conductances in the denominator of this equation are consecutively for plaster, air space, cork slabs, concrete floor, felt pad, carpet and film.

Solving

$$C = \frac{1}{.518 + .91 + 5.89 + .666 + .750 + .679 + .606} = 0.0998$$

Since the temperature of the circulating water in this case was 125F and a room temperature is 70F, we have a heat transmission to the room above = $(125 - 70) \times 0.0998 = 5.49$ Btu per sq ft of floor surface which is approximately 13.7% of the standard emission from a heated floor. A very close approximation of heat transmission may be obtained by applying this principle to any combination of materials of known conductivities.

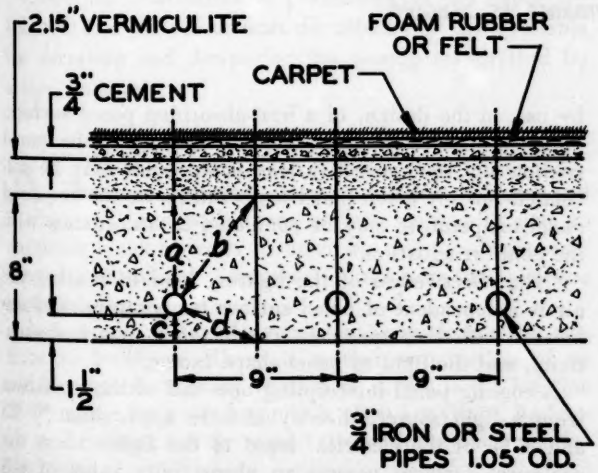


Fig. 18. Section through floor to show how insulating medium is used.

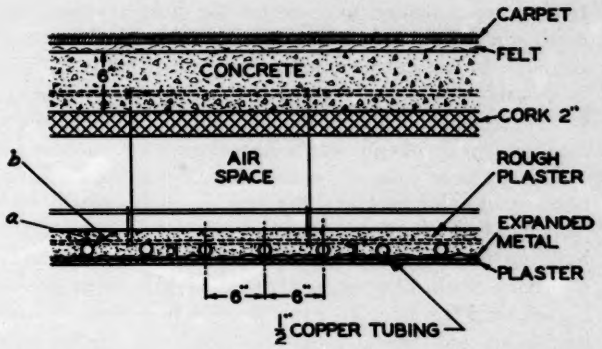


Fig. 19. Typical ceiling application where the suspended ceiling was used as the heating panel.

Conductivity Through Carpets

It will be noticed that for the carpet I have assumed a conductivity of 0.28 and a base thickness of 3/16 inch. The effect of carpets vary considerably according to the make and the thickness of the carpet. Therefore, it is necessary to give some consideration to the type of carpet to be used. For instance, a genuine Wilton carpet is woven with the pile interlocked into the base and while it invariably makes a much more durable carpet, it seems to retard the heat a little more than an Axminster. I have found from experience that with Axminster carpets, the heat appears to pass through more readily from the floor surface below, but, from authoritative sources, I learn that tuffts of the pile have a tendency to readily come away from the base.

I raise this question of carpets because since claims have been made that carpets on the floor make very little difference to the heat transmitted from a floor, some contractors have been misled by these statements, with the result that many owners of large residences have been considerably disappointed. While it may be possible to apply some types and makes of carpets on a highly polished floor and obtain a fairly high percentage of the heat emitted from the bare floor, it is quite certain that, if this theory is applied to all applications, without discrimination, sorrow and trouble will follow. When considering any type of floor covering, all the facts relating to the material should be carefully considered, especially when dealing with carpets where there is such a wide variation in the thickness and quality of the material.

Heat Loss from Building

Before investigating the question of heat emission from floor panels, I believe it is expedient that we first study the question of heat losses from a building, and in this regard I am referring to the total heat losses, based purely on the difference between the temperature of the air in the building and the temperature of the air outside.

We have known for years that under some conditions, a building will lose considerable heat by radiation, independent of air temperatures, and also by the same token, that a building will gain heat by radiant energy received from the upper stratosphere. It is a compara-

tively simple matter to measure the heat reaching the earth and buildings from the clouds, a heat which at times is found to be sufficient to disturb the balance of heat in a building, especially when the heating system is being controlled by an ordinary outside-inside instrument operated simply by outside air temperature only.

This gain or loss of heat of which I speak, is independent of solar heat and the exchanges which will take place because of other buildings in close proximity to the building under consideration. It seems to be especially noticeable with all glass structures, such as large greenhouses, and the like. To explain this phenomena, it has been computed that the radiations which provide the heat gain, emanate from a high temperature layer considerably above our own atmosphere, and in what appears to be a substantiation of this, we are informed by the Rand Corp. in Santa Monica, Calif., an organization of scientists, that above the earth's atmosphere, which incidentally may extend 15,000 miles, a temperature of 18,000F exists. Also, we are told that the temperature at 400 miles is 4,000F and that the earth's atmosphere at a distance of approximately 50 miles is computed to be about –50F. Recently, however, a temperature of –72F was actually recorded by an English four-jet airliner at a height of 40,000 ft, which evidences a layer of low temperature which can absorb heat energy. While these actual temperatures and conditions may not be exactly as computed, it is not unlikely that periodical changes in the upper part of our atmosphere will at times create conditions which will allow radiant energy to pass through the low temperature layer and to reach us from the space computed to be at 18,000F, and at other times when the radiant energy from the higher temperature layer is blotted out, heat energy will travel from the earth and the heated buildings to the space at –50 or –72F.

These things are mentioned to emphasize that figures which we record one day may appear entirely without foundation if a similar test is taken on some other day. Even though this may be more of a premonition than a fact, if we can still believe that one pound of water raised or lowered one degree F represents one Btu, then I suggest that in spite of all the computations which are made regarding radiant energy to and from a panel, the very high rates of emission which at times have been claimed for floor panels are not obtainable from a floor at 85F and an ambient air temperature of 68F to 70F. However they are arrived at by just assuming that a room or building is losing a given number of heat units, a conclusion which may be entirely erroneous.

Increased Emission Rate

It is possible to obtain a higher emission rate if the temperature of the floor surface is higher than 85F, or if the MRT of the unheated surfaces and air temperatures are low, as I will endeavour to show later. However, since comfort and health should be our first consideration, it will be very unfortunate for our profession if the principles for which we stand are abandoned for the sole purpose of obtaining a greater output from any type of heating unit. During the last few years, I have tried to analyze some reports on high rates of emission, but invariably the essential factors have been missing, and, consequently, it has not been possible to find sufficient data to substantiate any of the assumed conditions. I have noticed, however, that special emphasis has always been placed on the higher emission rates rather than on the possibility of smaller heat losses from the building.

I venture to suggest, therefore, that the conclusions arrived at in the special cases cited, are due to the fact that they have been based on calculated heat load factors using values for *U* which have been determined for quite different conditions which exist with radiant heat systems. Consequently, if such very high values of *U* as may be necessary in some methods of heating are used in estimating the total heat losses from the building involved in such investigations, it is practically certain that the anticipated heat to be given off from a floor will be much in excess of the actual, or even possible output. With this thought in mind, it may be advisable to approach the subject from this angle to determine how far such an assumption may lead us from the true facts.

Cooling Panel Performance Is Studied

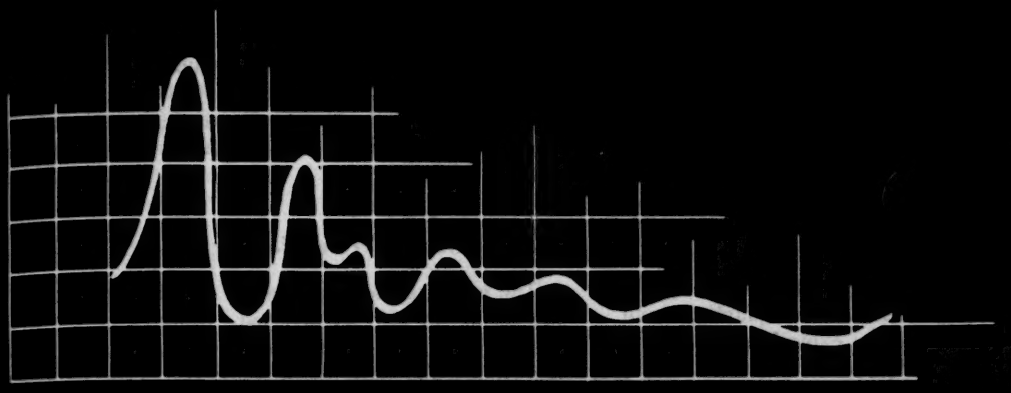
Internal radiation emitted from electric lighting filaments may constitute a major portion of the total cooling load, according to Merl Baker, assistant professor of mechanical engineering at the University of Kentucky, in a paper at the semi-annual meeting of The American Society of Heating and Ventilating Engineers. Prof. Baker said that for structures not equipped with cooling panels, the effectiveness of this energy in heating the room air varies with the equivalent overall conductance of the enclosure and ranges approximately from 96% to 68% for good and poor insulations, respectively.

"By use of cooling panels possessing a conventional finish," he pointed out, "these values decrease appreciably, ranging from approximately 62% to 48%. A further decrease to approximately 52% to 45% is accomplished by use, in the design, of a heat-absorbing panel surface.

"From the established relationships, both the panel cooling and the convective load components may be calculated for any given panel temperature, or the required panel temperature may be computed in accordance with the comfort equation.

"The effectiveness of the lighting load in heating the air is independent of panel surface temperature, and decreases with the equivalent conductance, panel absorptivity, and the light to panel shape factor."

A cooling panel intercepting one half of the radiation from a light source, directly absorbs approximately 23 and 37% of the electrical input to the lights when the enclosure surfaces possess an absorptivity value of 0.5 with a panel absorptivity of 0.5 and 0.8 respectively.



WATER HAMMER IN PIPE LINES

T. W. REYNOLDS

Water hammer takes place in a liquid line when the flow of fluid is suddenly arrested, or a valve or pump causes a quick change in velocity or pressure. It has sufficient power to rupture pipe or seriously shake a structure. Basic engineering information is presented on this important subject, and various devices described that are available for arresting and dissipating the energy transmitted by water hammer.

A HYDRAULIC ram was a common sight on the farm. The ram operated alone in a silent wooded and springy dell and with more or less noise, although its rhythmic clank of water hammer was not too displeasing. Since it seemed a part necessary to the ram, the noise was expected.

Not so with water hammer noise in modern water systems in buildings. There is neither anticipation of its sudden arrival, nor any rhythm to it. While the location of the cause for water hammer is often a mystery, basically, it is nothing but the same arrested force that operated the ram.

A hydraulic ram contains a valve which when raised by the velocity of falling water, closes and stops this water flow. The resulting impact (water ram, back surge, or shock) opens a second valve and elevates the arrested water to a point that is theoretically five times the height of the available fall from the source which supplies it. However, the actual lift is less because not all of the velocity or kinetic energy of the water column is dissipated in elevating the water. Some of the energy is lost by friction, raising of valves, and in the accompanying noise of water hammer.

Water Hammer Stretches Pipe

A sudden rise in internal pressure is built up in a pipe when a stop valve on the pipe is quicky closed, or the pump suddenly stopped by hand or power failure. The resulting back wave caused by interference to normal flow slams shut a check valve. Since the system is closed, water cannot be elevated. In this case, therefore, the energy is expended only in friction, sound, and an actual stretching of the pipe. If the pipe were of thin rubber, this stretching could be visualized; with more of the energy dissipated by this cushioning effect, there would be but little left in the way of sound.

Explosive pressures resulting from water hammer are often built up in only 0.1 second and with diminishing fluctuations continuing for one half second. Meanwhile, pipes stretch or expand and increase in diameter to accommodate each pressure rise, and then contract as the energy used up by this expansion drops the pressure. These alternations produce vibrations of pile driver effect in the pipe line, which in some cases, shake the adjacent structure of the building itself. All this has been recognized by the Federal courts which have ruled that water damage from a ruptured pipe is covered by the explosion terms of a standard insurance policy.

A dead end or check valve makes conditions much worse, as do certain piping combinations and conditions. The longer a reversed flow continues in one direction before interruption, the greater the water hammer will be when this flow is arrested. The knock will then occur at some point remote from the valve closure. For the same reason the quick closure of a kitchen faucet will sometimes burst a hot water tank some distance from the faucet, especially so where a pressure reducing valve or check valve prevents back flow of the wave into the cold water main.

Unfortunately, pipes of the usual metals are not sufficiently elastic, nor is water compressible to an appreciable extent. Only in the case of old lead water pipes, will the pipe walls be found visually thinned out by repeated stretchings from wave transmission of power as the waves ebb and flow. Even with this metal, pipes often split in time as pipe walls become thinner and bulges become too prominent. Lead water services to buildings, therefore, should always be protected by shock absorbers.

Results of Water Hammer

Some results of water hammer are chattering, damage to valve seats, leaks from distorted valve packings that are under enormous shock pressures, breaking away of interior pipe coatings, and leaks from loosening and wear of pipe threads and joints.

Pipe, valves, fittings and specialties even rupture as metals fatigue, especially where these are corroded, are too rigid or poorly supported. Meters, recording instruments and controls are also adversely affected, and pressure switches at pumps may operate erratically to start and stop pumps at surge peaks. Water hammer may even loosen pipe supports.

As with the proverbial last straw, a rupture in a pipe line often occurs at slight shock. This is similar to the dead tree in the forest, which having remained erect throughout the storm, falls during some quiet lull that follows. What is even less appreciated is that water hammer may be unknown in some cases, because, even with high internal pressures, there is no noise. This absence of noise, a paradox, makes the cause of leakage or rupture difficult to locate. Evidently, water hammer is the wrong word here, since it more properly designates conditions where noise exists.

Liquid Surge or Shock

Few realize that so-called water hammer is in reality a liquid hammer (in better terminology, a liquid surge or shock), since it occurs not only in water pipes, but also in pipes containing gasoline, oil, or other liquids more compressible than water that are under pressure due to pumps or head. The hammer or shock in its quality of note or intensity does not vary greatly with most liquids. It is less in magnitude for gasoline and oil for the same velocity of flow.

Factors Affecting Water Hammer

The pressure rise due to water hammer is about 60 psi per second of velocity arrested. Although only a rule of thumb, it is normally sufficiently accurate since velocity contributes the most to pressure rise. Pipe diameter is another contributing factor, because larger sized pipes contain more weight of water to arrest and have relatively less friction compared to the weight of water.

Other factors are quickness of valve closure and the length of pipe involved in the wave from the quick closing valve. The latter item determines the quantity of energy in the body of water and the time required for flow back and forth. Incidentally, as the length of pipe increases, so does the cost of any relief mechanism when this is made adequate to store or dissipate the greater amount of kinetic energy.

A pressure wave from water hammer starts with the speed of sound. For the purpose of this article this velocity can be fixed at one mile per second. The wave may travel back to a large water main and return, repeating this cycle until the energy has been dissipated or relieved by a relief valve, or some form of temporary storage mechanism.

Water hammer is not always caused by the sudden stoppage of flow. It can also arise from the opposite action of acceleration, such as by a valve opening or a pump starting—in fact, by anything that suddenly changes the velocity or pressure in a pipe.

Water hammer may be caused by various things other than stop valve closure. It may occur when a reciprocating pump stops and its check slams on the back wave; or when a flush valve or self-closing or snap action faucet operates. This happens with cellar drainers, water heaters, dishwashers, bottle washers, home washing machines with automatic shut off valves, drinking fountains, filters, water softeners with check valves, and various plumbing fixtures. Breweries, bakeries and distilleries have equipment with quick action valves, and laundry machines often have valves that close with only one quarter turn. All these should be protected by shock absorbers.

Shock absorbers are also necessary to insure quiet in the town house, hospital, apartment house, and in the farm building where the stock water at all hours from automatic drinking fountains. Even the animals become annoyed and stop drinking when use of the drinking fountain starts water hammer.

Water Hammer Reduced To Mathematics

According to Lewis H. Kessler of Northwestern Technological Institute, water hammer may be mathematically expressed as follows:

$$a = \frac{4670}{\sqrt{1 + \frac{d}{t} \times \frac{K}{E}}}$$

This formula is for the initial or supernormal wave in a pipe which is free to expand. This wave moves with a

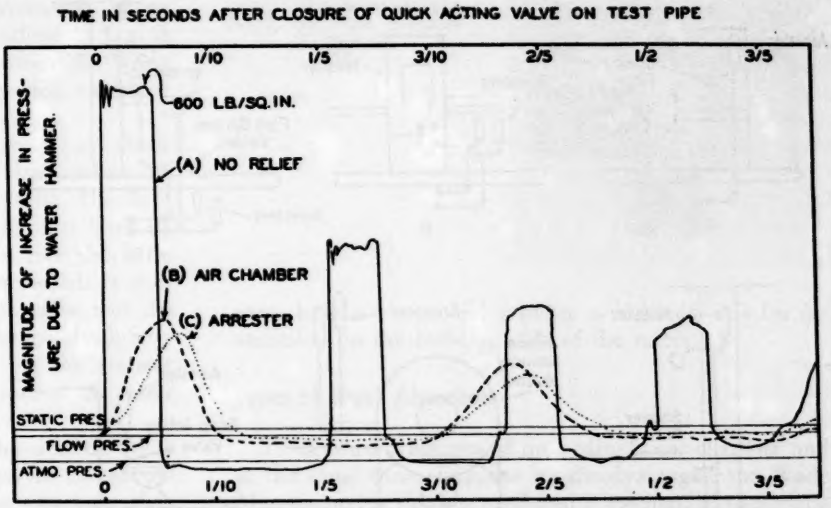


Fig. 1. Typical water hammer pressure-time diagrams showing maximum water hammer pressure wave in test pipe for various conditions.

velocity a feet per second, which depends on pipe diameter d inches, thickness of pipe wall t inches, modulus of elasticity of pipe material E, and bulk modulus of water K. In general, the value of a for small steel, iron, and copper pipes is from 4,000 to 4,500 ft per second, increasing as the size of pipe decreases.

If L is the length of pipe from valve to origin, the time required for the supernormal pressure wave to travel this distance and return is 2L/a. If the total time of closure of valve is equal to or less than 2L/a, the closure is said to be instant. Reference to origin means the beginning of the pipe, or that portion of the piping system notably affected by valve closure.

The variation of water hammer pressure in a small pipe under low initial flow pressure is illustrated in Fig. 1. This pressure-time diagram, selected from the Engineers' Manual of the Wade Manufacturing Co., was developed by Kessler and associates Gamet, Rohlich and Menuez. It shows an abrupt increase in pressure of 600 lb (curve A) which persists during the critical time 2L/a. This pressure rise in the first or supernormal pressure wave is the maximum which can be obtained by water hammer in a given size and kind of pipe with a given initial velocity of flow. It is of finite magnitude and independent of the length of pipe, except as this length determines the time of instant closure of the valve.

The pressure wave velocity was recorded at 10 ft per second, 7 ft upstream from a quick closing valve on 150 ft of ¾-inch pipe. Incidentally, a most useful instrument for such purposes is a pressure-time recorder such as types made by Electro Products Laboratories, Inc., Esterline-Angus Co., Inc., or Bacharach Industrial Instrument Co.

Zero time on the diagram is taken as the instant when the valve begins to close. Results of tests with an air chamber are shown at B and a mechanical-pneumatic arrester at C. Both show vast improvements over A, the test pipe with no relief device. Results with the arrester and the air chamber are about equal, providing the air chamber is properly sized, arranged and located, and initially filled and thereafter maintained with the correct amount of air. In actual practice, these conditions plus that of adequate maintenance are rarely met.

Valve closure, in time greater than 2 L/a, may also cause water hammer, but the magnitude is less than with instant closure. Many valves in effect close slowly for about 85% of valve movement. The balance of movement then controls the effective portion of valve closure, effective because of the great resistance to flow suddenly established.

If this final 15% valve movement takes place within the critical 2L/a, there will be water hammer. This shows the importance of slowly closing valves during their final closure. Perhaps some day some one may invent a practical means of controlling this trouble at its source—possibly some type of cushion incorporated in a faucet, or better still, a valve or faucet that cannot be quickly closed in its final or effective closure. However, the trend is toward quick closing valves on all equipment, whether for domestic or industrial use.

The effect on pressure rise due to slow closure of a valve can be simulated by the installation of an air chamber. This is shown by B. The magnitude of the pressure rise is reduced when the pressure wave advancing upstream causes some of the water to enter the air chamber. The rate of flow into the chamber becomes less as the pressure in the chamber builds up. As shown, there is less abruptness in rise and fall when compared with A of the same figure. With the air chamber, the pressure rise increases at a fairly uniform rate and reaches a peak as the velocity of flow in the pipe falls off to zero. The pressure then gradually decreases.

During the pressure wave rise, most of the kinetic energy is stored in the air chamber by compression of its contained air. This energy returns to the water in the pipe after the peak of maximum pressure has passed. It sets up a new but lower velocity in the pipe and in the opposite direction. In the entire process, energy is lost by conversion to heat in the air chamber and pipe line through air compression and by friction to flow in both pipe and the restricted passages to the air chamber.

Much of the material under this heading was extracted from Prof. Kessler's treatise in the Engineers' Manual. It has been reduced and rearranged to suit the general nature of this article and it is thought to be correctly interpreted. In addition to the research made by Prof. Kessler at Northwestern Technological Institute, his writings report the results of over 4,000 measurements of water hammer made with seven associates over a period of three years at the University of Wisconsin Hydraulic Laboratory.

Many devices and methods have been developed through the years in an attempt to find something of equal or

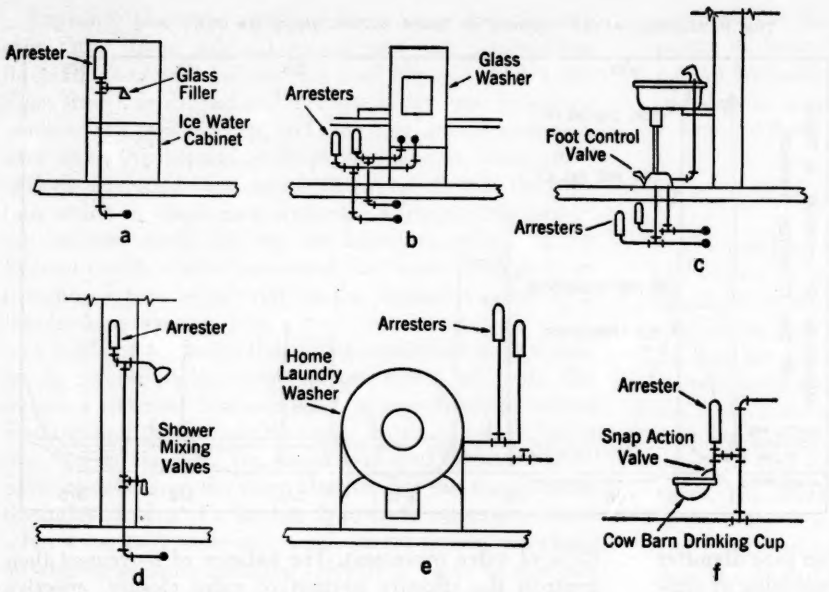


Fig. 2. Methods of installing the Wade arrester on special equipment: a, shock absorber at ice water cabinet; b, arresters eliminate water hammer at glass washer; c, protection against snap action valve; d, water hammer at shower is eliminated; e, absorbers at laundry washer; f, arrester at snap action valve.

greater effectiveness than that obtained with an air chamber maintained with the correct amount of air. Ordinary relief valves are sometimes used for this purpose, but such action is relatively slow compared to pressure rise. They may be subject to wear and in many cases require a drain pipe which is expensive and difficult to run. Surge tanks are also expensive and are apt to waste water through the overflow pipe. Certain other devices require considerable maintenance and have sometimes ruptured under water hammer pressures.

The Common Air Chamber

Space required for an adequate air chamber is not always available, especially on concealed piping. Pet cocks on the chambers are apt to leak. Water damage has been considerable in some cases, even where air chambers are exposed. In any event, there is a waste of time and water in draining piping systems and time consumed during the refill, when all this draining and refill is done just to replenish the air in air chambers. Drainage often entails a certain amount of inconvenience to users of the piping system and does introduce a lot of air. This may develop some inconvenience.

Under certain conditions, a water logged air chamber may even intensify the magnitude of water hammer. There are other conditions where an air chamber cannot safely be used as with explosive liquids which may expand into system and does introduce a lot of air. This may develop some inconvenience.

As a rule, air in an air chamber is replenished at atmospheric pressure. As the piping system is refilled, this air is compressed by the static pressure in the system. Even when the air is replaced under static pressure, it will still expand an appreciable amount whenever a valve is opened and the pressure drops to flow pressure. Each time this occurs, a part of the air in the chamber is lost to the system, as it is also from repeated shocks, and by mixture with and absorption by the water as it literally boils under such shocks.

Some air chambers are crudely designed and poorly located; if not, they are improperly installed. Size is usually determined by a shrewd guess. In any event, it

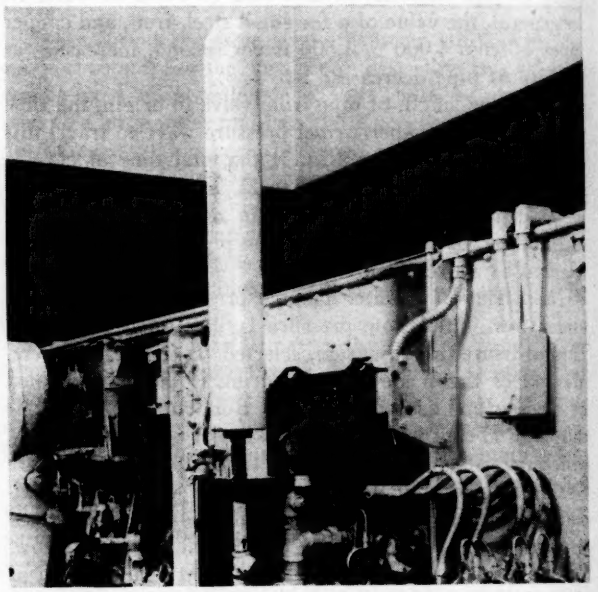


Fig. 3. Surges are absorbed at this bottle washing machine.

is well known that air chambers seldom retain their full amount of air for any appreciable length of time.

Methods of installing the Wade arrester on differing types of equipment are illustrated in Fig. 2. Vertical mounting of the arrester is not necessary, but such mount-

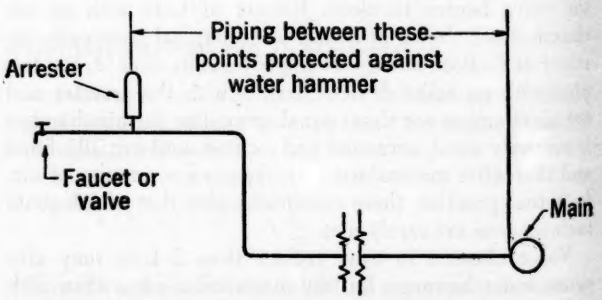


Fig. 4. Absorber should be close to the stop valve.

ing improves appearance, is more convenient, space saving, and avoids any collection of sediment. Fig. 3 shows a high pressure pump application where the Wade shock absorber is installed near quick closing valves of a bottle washing machine.

An air chamber, arrester, surge suppressor, or shock absorber is most effective in absorbing shock when, as in Fig. 4, it is located near the stop valve. The flow pressure is lowest there so the device will then have its greatest useful volume of air. This gives less shock on the valve, since the only volume of water which is suddenly stopped is that portion between the valve and the arrester. If the arrester is placed some distance back near the main, it will still be of some help, but the arrester itself may then act as a secondary source of water hammer.

Often it is not practical to install the arrester close to the valve. However, the distance between the two should normally not be more than 10 ft and in no case more than 20 ft. Piping and fixtures connected to the pipe between the valve and arrester will be positively protected from water hammer when these recommendations are followed, except in the case of a downfeed system. In such cases, the arrester may be located at the top of the riser where it joins the looped main. Incidentally, a main for purposes of this article is considered to be any supply pipe that is two or more diameters larger than the pipe run to the valve.

When a pump stops, the water leaving the pump suddenly reverses to slam shut the usual check valve. This starts a pressure wave in the pipe. The arrester should therefore be installed on the pipe just above the check valve. The air in the arrester is then ready to absorb the shock caused by reversal of flow in the pipe and thus prevent the check valve closure from starting a water hammer wave.

An arrester installed on the street side of a water meter will protect the meter and the piping system from any water hammer that originates from causes outside of the building. There may be pressure surges in the outside main due to hydrant closure, water works pumps, or shock originating in connected piping of adjacent buildings. To protect the meter from water hammer in the same building, a second arrester is required, this for installation on the building side of the meter.

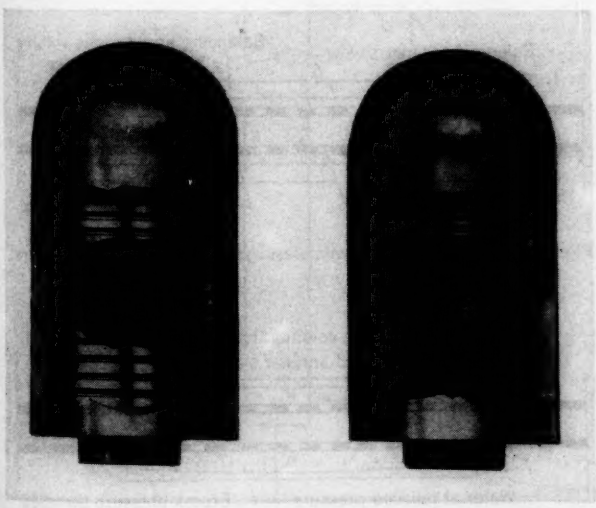
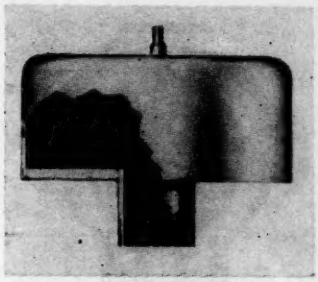


Fig. 5, left. Sealed Shokstop air chamber at rest and Fig. 6, right, the same chamber absorbing shock.

Fig. 7. The Shokstop, gas filled, for high pressure applications.



Types of Shock Absorbers

To obtain advantages of the ordinary air chamber and at the same time eliminate its disadvantages, the Wade Manufacturing Co. has produced a mechanical-pneumatic arrester or sealed air chamber invented by Prof. Kessler, called the Shokstop. Fig. 5 shows the device with the bellows at rest, while Fig. 6 illustrates how the bellows are forced together when absorbing a shock. Air is sealed up in the bellows to prevent air-water contact with resulting loss of air. This provides a permanent air cushion, one that cannot become water-logged.

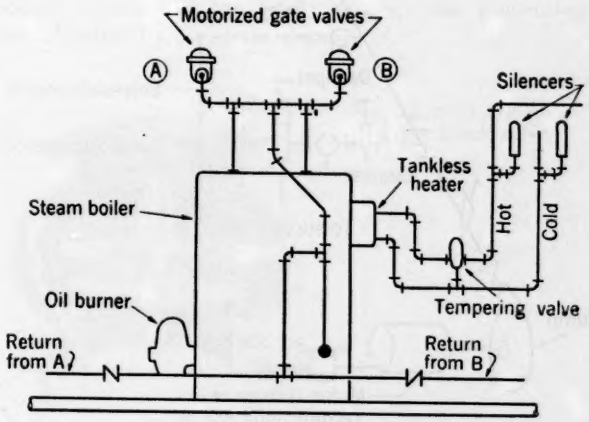


Fig. 8. Silencers for protection of tankless heaters.

Energy is absorbed in pipe friction, compression of the air, flexing of the bellows and by turbulence and eddy losses of water flow through small clearances around the bellows. The effect on the pressure rise is similar to that produced by slow closure of a valve. After the maximum pressure peak occurs, the energy stored by air compression is slowly returned back to the water in the pipe, creating a new velocity, less than the original and in the opposite direction.

The sealed air chamber is made in five sizes of which the largest is for 2-inch pipe. Should extreme conditions require the use of more than one unit, they may be used either in parallel or in series.

For large diameter pipe to hydraulic machinery and for excessively high pressures, the Shokstop has been designed with a gas cushion, as shown in Fig. 7. The bellows, in this case, is hermetically sealed to the outlet and the space between the casing and the bellows is pre-

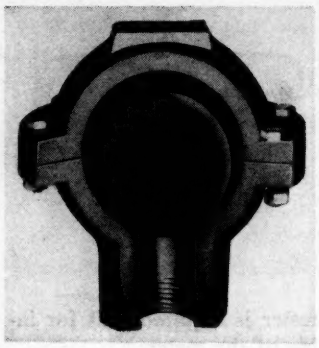


Fig. 9. Section of R-S Heyden Liquid Shock Absorber.

loaded with inert nitrogen at from 10 to 300 lb pressure.

A silencer, marketed by Mar-Coil Heater Co., is available in sizes ½ to 1¼ inches, inclusive. An application, in the case of a tankless heater, is illustrated in Fig. 8.

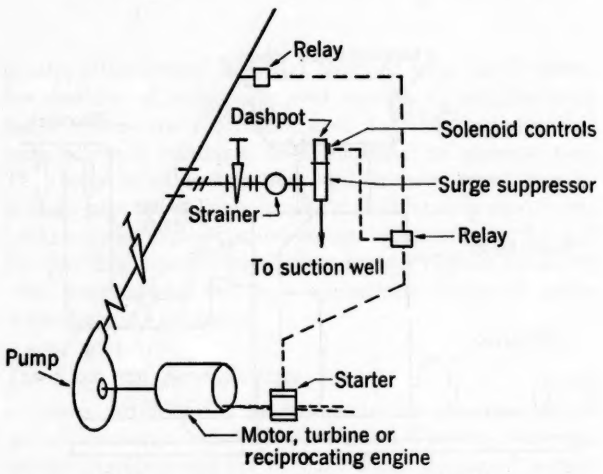


Fig. 10. Pelton surge suppressor as applied to pumps.

The Water Hammer Silencer produced by General Fittings Co. contains a reinforced diaphragm backed by copper leaf segments and an adjustable spring. The diaphragm is of neoprene and therefore non-corrosive. The indicator is provided with a lock nut. The silencer may be obtained in sizes up to and including 2-inch.

Fig. 9 illustrates the R-S Heyden Liquid Shock Absorber. It is made is sizes up to and including 2-inch and cushions any water shock by the air compressed within rubber balls.

The Pelton Water Wheel Co. has developed a surge suppressor in sizes from 2-inch to 24-inch, inclusive for application to pumps as shown in Fig. 10. Reverse water flow following power interruption to the pump prime mover is by-passed around the closed check valve to a suction well. The unit is electrically operated so that power failure initiates opening of the discharge valve in anticipation of any surge condition. Mechanical failure of a shaft or coupling causes the discharge valve to open and the motor to stop. Where the drive is by gasoline engine, or steam turbine, the surge suppressor may be either electrically or pressure controlled.

Fig. 11, the Fluid Dynamic Desurger manufactured by the Vedco Valve Engineering & Development Co., is made in sizes as large as 16-inch. Units are installed in parallel for larger pipe sizes and in series for extreme surge conditions. As shown, the desurger or absorber is an integral part of the pipe and operation is by through flow rather than by some device connected at right angles to the pipe. Excess pressure is throttled and removed from the system by flow through throttling orifices, Fig. 12, causing an annular sleeve to expand against a confined volume of gas surrounding the sleeve.

Finn & Co., New York, have adapted the rubber pipe approach to eliminate noise and vibration around pumps. It is known as Sound-Zorber and consists of specially compounded rubber pipes as flexible connections between the metal pipe lines and the pumps.

Silent operation of pumps is particularly desirable in hospitals, theaters and apartment houses, and is most necessary in broadcasting studios. It is also important for other applications.

In one studio, these flexible connections eliminated the interfering noises from its air conditioning plant. Other advantages of such connections are the ability of units to compensate for expansion and contraction of the pipe lines and to provide flexiblity for easy connection. They are not subject to electrolysis or corrosion, or liable to collapse under suction. Sludge does not adhere to these pipes as much as with metal pipes. Capacity of the rubber pipes is therefore maintained. Pipe is useful, in addition, in handling of abrasive materials.

The mechanical resistance to conductivity of sound in steel is over 3 miles per second. Therefore, a steel pipe extending from bottom to top of the Empire State Building would transmit a sound in 1/15 of a second. Replaced by these particular rubber connections, the time for the sound wave or vibratory motion would take 86 times as long, or about 6 seconds.

These connections are available in sizes ½ to 14 inches and in lengths from 12 inches up to 72 inches with the larger pipe diameters. The greater the length, the better the results. For extreme conditions, lengths can be obtained up to 50 ft. They are made for 150 and 250 lb working pressure (factor of safety 5 to 1) and for temperatures up to 150F with special heat resisting units capable of withstanding temperatures up to 250F. Ends are male in certain sizes and flanged in the larger sizes.

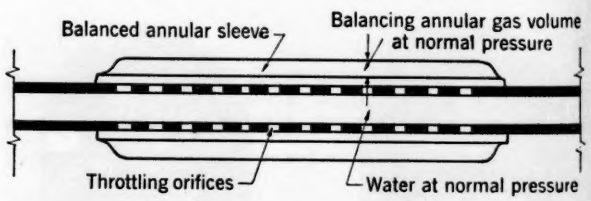


Fig. 11. Vedco fluid dynamic desurger under normal pressure.

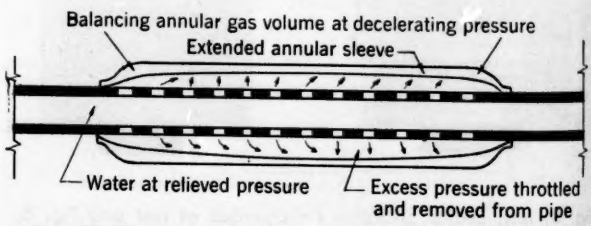

Balancing annular gas volume at decelerating pressure
Extended annular sleeve
Water at relieved pressure
Excess pressure throttled
and removed from pipe

Fig. 12. Desurger with sleeve extended to absorb shock.

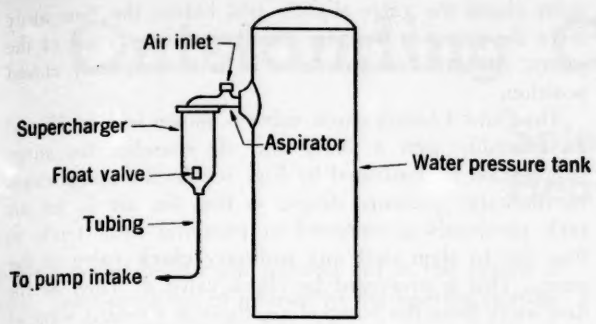


Fig. 15. Autocan Tanktrol for proper operation of pressure

Flanges are steel, and in certain of the units, they are backed up with rubber flanges.

Automatic Replacement of Air

The Supercharger, Fig. 13, made by Jacuzzi Bros. Inc., goes back to the principle of an air chamber when maintained full of air. It is a small inexpensive device for attachment to water pressure tanks to automatically maintain a proper balance between the air and water in the tank. The device is suited to horizontal and vertical tanks of various capacities and to all types of pumps or water systems. For remote tank installation, the arrangement varies slightly from that shown.

Water under pressure tends to absorb more air than otherwise. Due to this and other action, a tank eventually becomes water-logged to the extent that its remaining small air cushion loses its spring effect, thus causing the pump to start almost as soon as a faucet is opened. This is prevented by the Supercharger which automatically forces the correct amount of air into the tank.

As the pump begins to operate under water-logging conditions, pressure at the pump inlet drops below tank pressure. This causes water to flow at the higer pressure through the aspirator shown in Fig. 13. The velocity of flow through the restricted portion of the aspirator causes a lower pressure at that point to draw in air through an

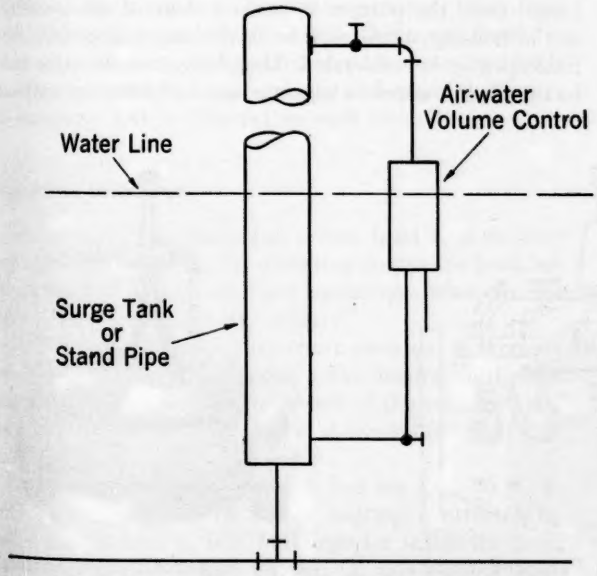


Fig. 14. Air-water volume control at surge tank.

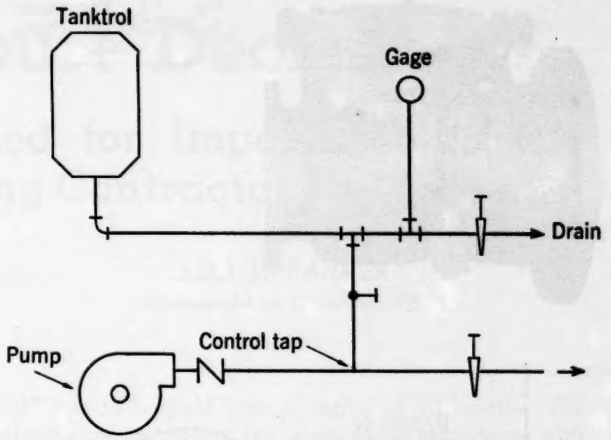


Fig. 15. Autocan Tanktrol for proper operation of pressure switches.

air inlet valve. When this replaces the water in the Supercharger, it causes the float valve to lower and close the bottom opening of the Supercharger, thus preventing loss of prime by air at the pump.

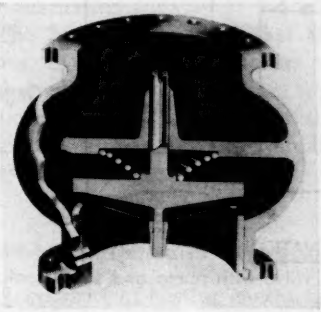


Fig. 16. Williams-Hager silent check valve.

When the pump finally shuts off, pressures and water levels equalize, so that the air stored in the Supercharger is pushed out into the tank. When sufficient air is added to the tank, the aspirator no longer draws in air because the water level is below the aspirator intake, thus making it inoperative.

The Nu-Matic Co. is another manufacturer that makes an air-water volume control, Fig. 14, in this case for attachment to a water pump.

Time Delays

To avoid the improper operation of pressure switches at pumps under surge and other conditions, the Automatic Control Co. has developed the Autocan Tanktrol, Fig. 15. It is connected to the pump discharge on the tank side of the check valve and it operates entirely from pressure. The thermal time delay of this control prevents the pump from starting until surge peaks have become stabilized. The timer is adjustable from ¾ to 2½ minutes. Fewer pump operations save wear and tear on the pump and related items, reduce maintenance, save power and give better control.

Check valves that are designed to prevent water hammer from check valve closure are: Silent developed by The Williams Gauge Co., Fig. 16; Quiet Closing by Rensselaer

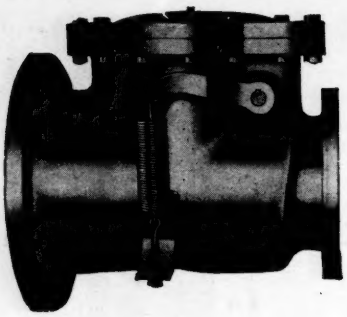


Fig. 17. Rensselaer Quiet Closing check valve.

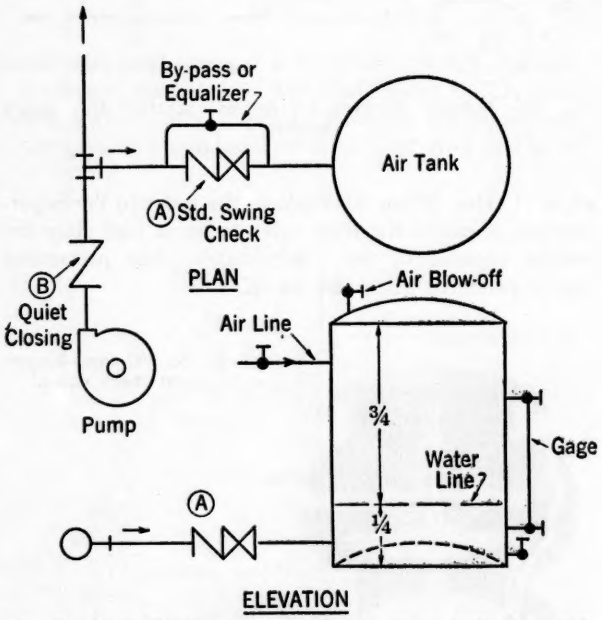


Fig. 18. Quiet Closing check valve with pump and surge tank.

Valve Co., Fig. 17 and 18; No-Slam by Cla-Val Co., Fig. 19.

A cutaway view of the Silent check valve is shown in Fig. 16. It is available in 1-inch to 10-inch sizes in another type and in 12- to 20-inch sizes in the type illustrated. Both types have a free floating disc that will operate efficiently and normally regardless of valve position—horizontal or vertical, or even if upside down, or installed at an angle. As the pump stops, the spring force in the valve closes the valve slightly just before the flow away from the pump is stopped. This prevents reversal of the pump. At zero flow the valve is in a completely closed position.

The Quiet Closing check valve is shown in Fig. 17 and an assembly with a pump and air chamber for surge suppression is illustrated by Fig. 18. As the pump stops, its discharge pressure drops, so that the air in an air tank previously compressed at pumping head tends to flow out to slam shut any ordinary check valve at the pump. This is prevented by check valve *A*. Then as the flow away from the pump stops, there is a return wave or surge, the energy of which drives the wave through the standard swing check valve *A* and into the tank where its energy is largely absorbed.

The small by-pass line around the check and gate valves is required to equalize the pressure between air chamber and pump discharge line. The by-pass valve is adjusted by pressure-time graphs until there is no slam in Quiet Closing check valve *B* during surges. The gate valve should be of a type which does not chatter. Check valve *B* has a lever arm with spring acting to return immediately the flap to its seat when the flow from the stopped pump has ceased.

The No-Slam check valve, Fig. 19, is shown in open and closed positions. When the pressure at the check valve inlet exceeds discharge pressure the disc gradually lifts from its seat as water in the cover chamber is expelled into the discharge end of the valve. When the discharge pressure exceeds the valve inlet pressure, water fills the cover chamber to close the valve. This also insures a tight closure. The rate of opening and closing can be adjusted to eliminate shock. Slow opening eliminates surges and allows a centrifugal pump to start with a small load, yet without a sudden pressure rise. This valve is available in all of the usual pipe sizes.

A Surgemaster control can be added to this same check valve, as shown in Fig. 20. Its action is then similar to a hydraulic door closer. The control automatically slows down the valve closing from a fast start to ease the disc to its seat through its final or effective closure. The opening of the valve is likewise controlled, the initial opening through the critical point being slow. As this point has been passed the plunger is pushed clear of the opening in the housing, then, as flow is no longer impeded, the final opening is accelerated. The plunger on the stem can be raised or lowered to regulate speed of valve operation.

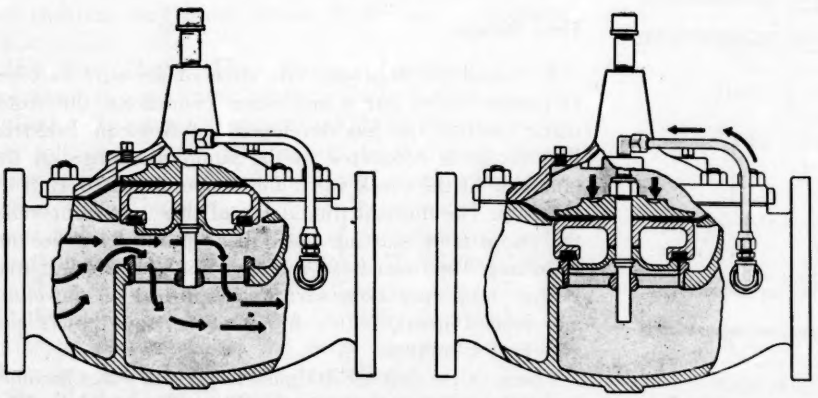


Fig. 19. No-Slam check valve of Cla-Val Co. in open position (left) and closed position (right).

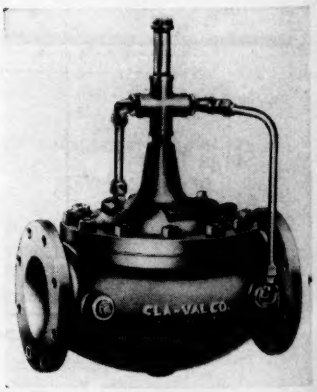


Fig. 20. Surgemaster control added. Closed position.

Outstanding Court Decisions

Selected for Importance to the Heating Contractor and Industry

Essential points of law are pointed out in this review of higher court decisions of interest to the heating contractor and to the men in the industry.

LEO T. PARKER
Attorney-at-Law, Cincinnati, Ohio

RECENTLY, the higher courts in different localities have rendered several unusually important and outstanding decisions involving heating contractors and sellers of heating appliances and equipment. Particularly for the reason that these decisions contain valuable legal information and suggestions as to how heating contractors, manufacturers and sellers of heating equipment may reduce and avoid liability, we shall review these selected timely litigations.

Equipment Attached to Building

It is well established law that a contractor cannot repossess and remove heating equipment attached to real property if the owner sells his property or gives a mortgage to secure a loan.

For illustration, in Bank of Poplar Bluff v. Casey, 231 S. W. (2d) 851, a heating contractor installed in a building a furnace, furnace blower, furnace stoker, and furnace pipes. The contractor took a chattel mortgage on this equipment to secure payment from the building owner. Quite obviously these items and equipment were permanently attached to the building. Later, the building owner with knowledge of the contractor, obtained a loan on the building. The building owner did not promptly pay the heating contractor's bill and the latter filed suit to repossess the furnace and accessories. In holding against the heating contractor, the higher court said:

"Where the company (heating contractor) that held a chattel mortgage on a furnace and other items from the owner of real estate, had permitted such owner to attach the items to the realty, and to procure a loan on the realty, the company lost its interest in such items."

Disposition of Stokers

Considerable discussion has arisen from time to time over the legal question: "If a heating contractor breaches his contract to install specified equipment, what are the legal rights of the property owner?"

According to a late higher court decision, a property owner need not pay a contractor for heating equipment installed contradictory to the terms of the contract, and the property owner may, without consulting the contractor, remove the equipment.

For example, in Bordonaro v. Vanden Co., 76 N. E. (2d) 755, it was shown that a heating contractor installed four stokers in four buildings for which the property owner agreed to pay $1,187. Of this amount $620 was paid in cash by the property owner and the balance $567 was to be paid over a period of 12 months. The property owner made a few payments in accordance with the terms of the contract, and then stopped making payments. He alleged that the stokers did not comply with the guarantee made by the contractor. The contractor filed suit for the balance due and proved that the property owner had removed two of the stokers from two buildings without giving any information as to their present location. The contractor contended that this was illegal on the part of the property owner who must pay the full balance due, although the stokers did not conform with the guarantee.

The higher court held that the act of the property owner in removing the stokers which did not conform with the contractor's guarantee was not an illegal act, and the contractor could not collect the agreed contract price since the stokers did not comply with the contractor's guarantee.

Contractor's Defective Contract

A majority of heating contractors believe that they may repossess heating equipment on failure of the property owner to make agreed payments, although the contract between the contractor and the property owner contains no repossession clause. This is not so.

For example, in Elder v. Sage Heating Co., 42 N. W. (2d) 919, the testimony showed facts as follows: The Sage Heating Co. installed heating and plumbing fixtures in property owned by one Elder. The heating company neglected to include in its contract a clause that it could repossess the equipment and materials if Elder defaulted in making agreed payments. Elder did default, and the heating company removed the equipment and fixtures valued at $900.

The higher court held the heating company liable to Elder for $900—the value of the repossessed equipment plus $150 additional damages.

Patent Rejected

It is well established law that an inventor cannot obtain a patent on an invention shown or described in an old publication or patent.

For example, in Application of Wiegand, 182 Fed. (2d) 633, it was shown that an inventor filed an application for a patent having this important claim: "A furnace carbon black comprising not less than 97% fixed carbon and having a surface area within the range extending from 7.5 to 10 acres per pound."

The Patent Office Examiner refused to allow the patent in view of older United States patents, as follows: No. 1,920,352; No. 1,909,163; No. 2,163,630; No. 1,999,541; and No. 1,987,644.

Any reader interested in reading these old patents may obtain copies by addressing: The Hon. Commission of Patents, Washington, D. C., giving the numbers of the patents desired, and 25 cents for each copy.

Must Prove Verbal Contract

Generally speaking, the higher courts compel property owners to pay the full amount of a contractor's bill where the property owner relies on an alleged verbal agreement.

For example, in Aberdeen Heating Co. v. Foster, 222, Pac. (2d) 824, a property owner named Foster made a verbal arrangement with a general contractor to construct a dwelling. In subsequent litigation Foster contended that the general contractor had agreed to complete the job for $12,000. The higher court ordered Foster to pay the contractor's $19,596 bill. The court said:

"Costs may have been somewhat increased due to changes in the plans and materials as the work progressed. Labor costs were increased substantially because Hedstrom (general contractor) kept his crew on the job regardless of weather. The months of February and March were exceptionally wet, and the efficiency of carpenters was reduced about fifty percent on rainy days."

The general contractor had employed the Aberdeen Heating Co. to install the heating. Controversy developed over payment for the heating system and the Aberdeen Heating Co. filed a separate mechanic's lien. In holding the lien valid, the court held that the general contractor may pay the Aberdeen Heating Co. and the former may recover this amount from Foster. The court said:

"In the event that the Fosters fail to pay the lien charges which have been established against them and in favor of the Aberdeen Heating Co., and if the same are enforced and collected against appellant (general contractor) by virtue of the judgments herein granted against appellant, then appellant should be granted judgment over and against the Fosters by subrogation for any and all sums so paid by appellant."

Employe Delays Suit for Compensation

According to a late higher court decision, an injured employe who fails to file suit to recover compensation within one year from date of the injury is barred from a favorable judgment.

For example, in Pittman v. Dixie Stove Works, 46 So. (2d) 43, it was shown an employe of the Dixie Stove Works sustained an inguinal hernia when delivering a heavy stove to Broussard's Restaurant.

Since the employe failed to file suit for compensation within one year, the higher court held the employe not entitled to receive compensation and said:

"Evidence sustained conclusion that suit was not instituted within one year's time prescribed by law and was barred."

Valid Heating Ordinance

Considerable discussion has arisen from time to time over the legal question: "Is a city ordinance unconstitutional and invalid which requires owners of business buildings to employ expert heating employes to maintain a specified temperature?" According to a late higher court decision the answer is negative.

For example in City of Newark v. Charlton Holding Co., 74 Atl. (2d) 641, the validity of a city ordinance was contested which provides that the temperature in business buildings must be maintained 68F and higher.

Testimony showed that the Charlton Holding Co. owns the three premises which it rents out as business establishments where persons are employed. All of these premises are heated by the same oil-burning heating plant. On February 20 at 10:45 a.m. the temperature in certain of the premises had fallen to 44F, when the outside temperature was 14F; on February 27, when the outside temperature was 18F, at about 10 a.m., the inside temperatures in two premises varied in various parts from 61F down to 57F. The effect of this lack of heat was that many employes in each of the premises quit work. It further appeared that the Charlton Holding Co. has no employe to supervise the performance of the oil-burning apparatus, but employs a single general maintenance man to take care of all the premises. This employe checks the heating apparatus each day at 7 a.m. and if the same is then in good working order, he leaves the premises for the rest of the day. If not in good working order, since he is not an oil-burner mechanic, he notifies the oil-burner service repairman to make needed repairs.

Notwithstanding, the counsel for the Charlton Holding Co. argued that it could not be convicted of "wilfully" violating the ordinance. The higher court upheld the lower court's conviction saying:

"Defendant's (Charlton Holding Co.) claim that it acted with due care to maintain the heat at 68F the standard fixed by the ordinance for the working period, appears insupportable."

With respect to the contention that the ordinance is unconstitutional, the higher court said:

"Its main contention is that such ordinance is unconstitutional as an invalid attempt to exercise the state police power. The heating ordinance of the City of Newark would seem valid, as a reasonable exercise of the state police power, delegated to the city and its health department. The convictions of defendant (Charlton Holding Co.) are accordingly affirmed."

Circumstantial Evidence

Recently a higher court rendered a rather unusual decision to the effect that a heating contractor may be held liable for destruction of a building by fire on circumstantial evidence.

For example, in Eaton Realty Co. v. Petroleum Heat and Power Co., 75 Atl. (2d) 178, the testimony showed facts as follows: The Petroleum Heat and Power Co. installed an oil-burning furnace in a dwelling, under a contract in which the heating company agreed to keep the furnace in operating condition. As alleged by the property owner, the heating company had been servicing the oil burner and while "said oil burner was under their control, negligently permitted it to set fire" to the dwelling house.

There was no direct proof that negligence of the heat-

ing company in failing to properly service the heating system resulted in the fire.

The higher court held that although negligence is not presumed from the mere happening of a fire, it is not necessary that it be proved by direct evidence but may be established by proof that the heating system causing the fire was "within the exclusive management and control" of the heating company and that the fire was such as could not have happened in the ordinary course of events without the contractor's negligence.

In other words this court held that a heating contractor may be held liable for destruction of a building by fire upon circumstantial testimony which tends to prove that the contractor's negligence in properly servicing the equipment resulted in occurrence of the fire in the building.

Lien Is Valid

While, generally speaking, a heating contractor may have a valid mechanic's lien on real property to secure payment for labor and materials, this is not so if the property owner convinces the jury that the contractor defaulted in completing the work. However, the contractor is entitled to a lien if the property owner fails in these respects.

For example, in Blue Ribbon Dairy Co. v. Schnarr, 88 N. E. (2d) 779, the testimony showed that a contractor refused to give a corporation a definite contract price on the proposed work, because of the unsettled material and labor conditions. The contractor agreed to perform the work according to the plans on a basis of cost, plus 10%.

During the course of the work, officials of the corporation ordered many changes in the original plans. Also, the contractor was ordered to install an additional cold storage department, not mentioned in the original plans and specifications. This work was done strictly in accord with the directions of the corporation's officers.

When the work was completed, payment was refused.

The contractor filed a mechanic's lien. It was contended by the corporation's officials that the contractor's price was too high and also that he had not completed the work in a satisfactory manner. Since the officials of the corporation failed to convince the jury that its contentions were correct, the higher court held the contractor's mechanic's lien valid.

No Allowance for Tools

Considerable discussion has arisen from time to time over the legal question: "Can a contractor charge for use of his tools and equipment when doing work under a cost-plus contract?" According to a late higher court decision, he cannot.

For example in Michelson V. House, 218 Pac. (2d) 861, the testimony showed facts as follows: A contractor on a cost-plus basis installed in a building certain heating, plumbing, electrical work, machinery and equipment. Litigation arose when the property owner refused to pay the contractor 10% on various items of equipment. In justifying their use, the contractor argued that he saved the property owner additional expense.

In refusing to allow 10% on tools and equipment used by the contractor in completing the job, the higher court said:

"The contract is silent respecting reimbursements for personally owned equipment. In the absence of such stipulations, appellant (contractor) was required to furnish the necessary equipment for the work at hand. The claim was a part of the overhead which expressly excludes reimbursement for overhead and general expenses."

For comparison see Campbell and Co. v. Somers, 276 Pa. 409. In this case the testimony showed that the work was done "on a time and material basis, with 10% profit as compensation to the contractor, the records of the cost to be kept at all times in such a manner as to be checked and audited by the owners."

The contractor sued to recover payment on cost items such as rent, heat and light. In rejecting the claim the court said:

"The words (on a time and material basis with 10% profit as compensation to the contractor) will not be extended beyond their exact meaning, and indeed they should be given a restricted meaning."

Tools Must Be Supplied

And again in Shaw v. Beaumont Co., 102 A. 151, the court in disposing of the question whether a contractor can charge a property owner for use of tools, said:

"A contractor, must, in the absence of a contrary agreement, furnish all the tools and necessary appliances for the work contracted to be done."

See also, Advance Auto Body Works v. Asbury Transp. Co., Inc., 10 Cal. App. (2d) 619, where under a cost-plus contract, charges of a contractor for depreciation on machinery was disallowed, as not being a part of the cost of the work.

This latter court explained that a property owner may be liable for paying a contractor for use of his tools and equipment if a clause to this effect is inserted in the contract that exists between the property owner and the contractor.

Guaranteed Service

If a heating contractor sells an appliance and guarantees to keep it in good condition, he is liable for failure to keep the appliance in safe condition.

For illustration, in Finley v. Tenn., 231 S. W. (2d) 793, the testimony showed facts as follows: A property owner sued the contractor for damages and proved that a gas heater exploded which he had purchased from the heating contractor who had installed it. Also, the contract provided that the contractor would "keep up" the heater at all times.

The property owner had called the contractor over the telephone and reported that the heater needed repairs. However, no one came and the next day the property owner again reported that the heater would not burn. The contractor promised to send an employe to fix the heater but did not do so. The following day the heater exploded and the building burned to the ground.

In holding the contractor liable for $19,500 damages, the higher court explained that to avoid liability it was incumbent on the contractor to prove that the damages was not caused by a defect in the heater and for which the contractor was not responsible.

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Reflective Ceiling Cuts Shop Fuel Bill

PROBLEM: At the Simmons Machine Tool Co. of Albany, N. Y., said to be the largest machine shop in the eastern part of the United States, it was decided to insulate ceilings against heavy heat losses in the winter and to do the job, if possible, without interruption of production in the plant.

SOLUTION: On this installation, 56,000 sq ft of Alfol, multiple layer aluminum foil insulation product of Reflectal Corporation, New York, N. Y., was applied to a flat steel truss roof. Although this job entailed the use of 1 x 2 inch furring strips bolted to the roof, the entire application was completed with no interruption of shop routine. The insulation consists of three layers of aluminum foil, two of which pop up on application to suspend themselves in the air space between joists. The bottom foil layer, which provides the light reflecting finish, is laminated to a heavy, waterproof duplex backing. Packaged in 250-sq ft rolls, the material is stapled across the faces of the joists or, in the case of the Simmons job, the furring strips, and is self-supporting and requires no other type of reinforcement.

RESULTS: Winter fuel savings up to 50% have been reported, summer comfort is increased where internal heat loads are not heavy, illumination is nearly doubled, and an apparently permanent ceiling finish provided.

Warm Floor for Cold Room Workers

PROBLEM: A problem confronting operators of the Cashmere Fruit Growers' Union plant at Cashmere Valley, Washington, was how to keep employees comfortable when working in temperatures which must be held at approximately 50F. Workers in the processing areas caught frequent colds and complained of cold feet.

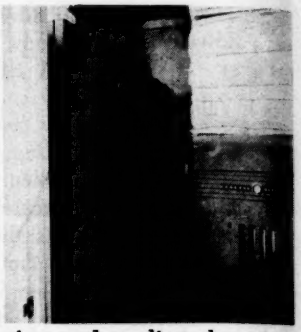
SOLUTION: The operators installed radiant heating coils of A. M. Byers wrought iron pipe beneath floors of work areas. Steam is circulated through the coils.

RESULTS: Employees are kept comfortable even though the radiant heating system has little effect on the temperature of the air.

Low Cost Houses Feature Air Conditioning

PROBLEM: In a Dallas, Texas, development, East Ridge Park, built by the combined firms of Laughlin & Silver and Lewis & Lamberth, six-room houses were to be built to sell for $12,500 and to feature year-around air conditioning.

SOLUTION: Each of the homes will be equipped for summer cooling with General Electric's new summer air conditioner (FE-20) designed especially for residential use. Houses will also have a GE gas-fired warm air furnace for winter heating. The two units are tied together by a common duct system and heating and cooling thermostats control the temperature the year round.

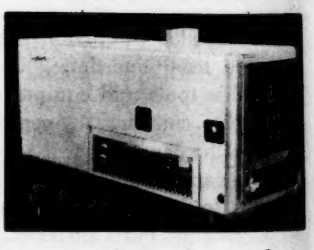


RESULTS: Initial response of visitors was enthusiastic. The development, consisting eventually of 210 houses, is believed to be first in the low-price class to boast complete year-round air conditioning. The combined heating and cooilng system cost $1,500 installed in the Dallas homes. Operating costs of the Dallas project have been estimated at approximately $93 a year for normal cooling season and about $40 for a normal heating season. Other Texas builders have decided to include year-around air conditioning after seeing the response to opening of The East Ridge Park development.

Silicone Finish Stands High Heat

PROBLEM: Protection of combustion chambers and outer coverings of heating equipment has always been a producer's headache because of the high temperature finished coatings must withstand.

SOLUTION: The John Zink Company of Tulsa, Oklahoma is using Sicon, a heat stable silicone base finish, manufactured by the Midland Industrial Finishes Co., Waukegan, Ill. Sicon aluminum is used for combustion chambers and the same base with attractive colors is used for protection of outer coverings of central gas heaters manufactured by the Zink Company. Sicon may be applied by brushing, spray or dip to any chemically clean surface.

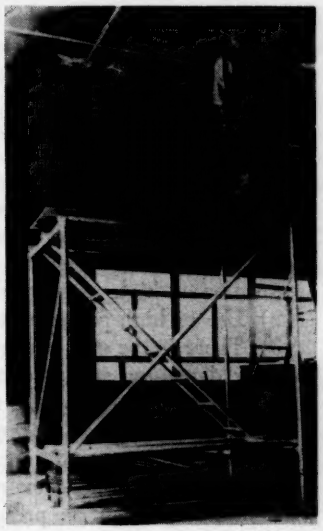


RESULTS: Combustion chambers and heater cases withstand temperatures of 875F without powdering or fading.

Rolling Towers Save Time on Job

PROBLEM: A plumbing installation for a 12,000 square foot research laboratory at the California Packing Corp. in San Francisco was being made by the James A. Nelson Co., plumbing contractors. For installation of overhead pipes, it is necessary to use some sort of scaffolding equipment.

SOLUTION: A rolling tower of aluminum, product of Up-Right Scaffolds of Berkeley, Calif. and Teterboro, N. J., was used. Tower has no nuts, bolts or loose parts and it folds to a compact unit 6½ inches thick weighing 64 lb. One model of the tower (illustrated) is 4½ ft wide by 6 ft long by 6 ft high, adjustable by means of screw jack bases to 8 ft. Full or half sections can be added to raise the tower to any height desired. The tower members are formed of heat treated aluminum alloy, one-third the weight of steel.



RESULTS: Nelson foreman, Frank Baird, claims that the light weight and ease of erection saves at least 50% of the time required to handle a steel tower of similar dimensions. The Nelson Company has purchased several of these towers. One man can carry tower from storage space to truck, from truck to job area, and erect it in two or three minutes.

Window Units Cool Motel

PROBLEM: The Park Motel in San Antonio, Texas, built in 1935, contains fifty accommodations ranging in size from a single room with bath to three-room suites. Although picturesquely situated, it was beginning to feel increasing competition by air conditioned places.

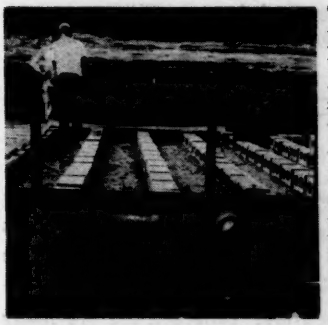
SOLUTION: Col. Jack Lapham, operator of the motel, recently completed installation of United States Air Conditioning Corp.'s ½ ton window type room conditioners. Installed simply in the buildings' double hung windows, the units provide each guest with individual control of temperature and can be used for simple ventilation in moderate weather.

RESULTS: According to R. F. Haner, manager of the Park Motel, a great many guests have commented on the efficiency, operation, and attractive appearance of the equipment. Business has been stimulated by the addition of these units.

Blower Heater Warms House Slab

PROBLEM: In a California housing development, floors were made of poured concrete supported by corrugated iron laid on concrete blocks. It was desired to heat the house radiantly by blowing warm air through the channels of the radiant concrete slab.

SOLUTION: A Kilbury gas fired heater was used. This heater is equipped with a centrifugal blower which was found effective in circulating the air beneath the slab. The blower moves a small volume of air at high speed and entrains a large volume of secondary air. The heater is unvented, combustion air being blown through and finally exhausted through an external vent. The temperature of the air leaving through the exhaust is approximately 10 degrees below room temperature. Approximately 107 cfm is exhausted through a 6-inch round open exhaust.



RESULTS: While there is a temperature gradient gradient across the slab from heat source to exhaust, temperatures are comparatively low and gradients are not too sharp in this California location.

Steam Tracer Keeps Oil Line Flowing

PROBLEM: Fuel oil lines at the General American Tank Storage Terminal, Argo, Ill., carry heavy fuel oil from a manifold pit to storage tanks. In cold weather it is necessary to warm the lines in order for the oil to flow.

SOLUTION: Two-inch steam tracer lines were installed along 10-inch oil lines and both pipes wrapped in blanket mineral wool insulation. Mineral wool blanket sections 24 inches long and 2 inches thick were wrapped around the two pipes and laced together with metal wire. A 28 gage corrugated aluminum jacket, with an asphalt felt weather-proof liner applied to its inner surface, is then wrapped around the blankets. Galvanized metal bands are spaced on 8 inch centers along the length of pipe.

RESULTS: Steam pipes prevent temperature drop in No. 5 and No. 6 oils which are held at 95F and 140F respectively. Maintenance of higher oil temperatures insures low viscosity and facilitates pumping and handling of oil.

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

TWO items that are common to the industrial plant engineer are unit heaters and high pressure system. That is why the problem that is presented for discussion in this issue should prove to be of uncommon interest and of some value. It is but one of the important questions that have been treated since this department was inaugurated.

There are no strings tied to this service. Should you have a problem that you would like to see discussed, providing it is of interest to the industrial plant engineer, send it in. Or if you have some comments that you would like to add to the discussion of a problem scheduled for a future issue, please write. Such letters will be most welcome.

This Month's Problem

A question has been raised that as long as we have steam at 100 lb pressure in our plant, why not use this steam to serve some unit heaters that we have. Do you consider this good practice or is it better to use low pressure steam for such heaters? Where there are many unit heaters to be served, is the saving in pipe size through the use of high pressure steam of sufficient importance to merit use of high pressure steam?

Answers to this Problem

Although experience indicates that the heat output of a unit heater is increased from 45 to 50% when the steam pressure is increased from 15 to 100 psi, the actual heating effect at the working level is no greater than the capacity of that heater at 15 lb pressure. Those close to operating problems have found that the use of high pressure steam is wasteful and otherwise objectionable.

Another disadvantage of high pressure steam is that the life expectancy of many unit heaters has been found to be only about half as much at a working pressure of 100 lb as when it is operating at low pressure.

Studies of corrosion in steam heating systems have shown that use of high pressure steam is responsible for much of the corrosion of unit heater sections. In some cases this may be due to original presence of elements in the water that in themselves prove corrosive to copper and copper alloys. In many operations quantities of oxygen and carbon dioxide are liberated by the breaking down of carbonates which occurs in steam generation at high pressures. Since most chemical reactions are greatly accelerated by increase in temperature, the presence of oxygen and carbon dioxide in substantial quantities is likely to prove very serious from a corrosive standpoint in the presence of high pressure, high temperature steam when the gas dissolves in the condensate to form an acid condition.

Briefly, it can be stated that:

(1) A unit heater, regardless of make or type of construction, can be expected to last twice as long on low pressure as on high pressure steam.

(2) Use of high pressure steam accelerates corrosion.

(3) There is the ever-present hazard of burning occupants or damaging stock in case of a break in the high pressure heating main or the release of sprinkler heads.

(4) The cost of high pressure fittings and traps is greater than the cost of low pressure accessories, and maintenance cost may be expected to be higher.

Therefore, when high pressure steam is available it should be reduced to low pressure for heating purposes. This can be done at little, if any, increase in first cost by proper sizing of the piping and with a consequent large yearly saving in fuel cost.

In most cases the reason high pressure steam is selected for space heating is because of the belief that the piping system can be made smaller and the cost will be less. When due consideration, however, is given to all the factors, this does not prove to be a sound premise. The conventional low pressure steam heating system has

Problems for Coming Issues

August Issue

At times we have been adding copper sulphate to the water in our cooling tower to control algae and slime. I have been advised that our water, which is slightly acid, will in time attack the wood structure of our cooling tower. What is the general experience under such conditions? What can be done to prevent this?

September Issue

We have a centrifugal pump which has a rating of 600 gpm. It has been in service for a number of years and the total head by gage measurement has increased six feet from its original 75 feet total head and at the same time the pump capacity has decreased. I suspect that the pump impeller may be at fault. If the impeller is the cause, can you suggest a means for correcting the trouble? If you believe there may be some other reason for this trouble, what can be done?

mains, branches and risers designed on the basis of somewhere about ¼ lb drop in pressure. Such a system has comparatively large pipe sizes as compared to a high pressure system. Where high initial pressure is available, however, the low pressure system can be designed for a large pressure drop, resulting in pipe sizes but little in excess of the sizes that would normally be used on an equivalent high pressure system.

Where the initial pressure is from a high pressure system, it is entirely practical to design the low pressure distributing system on the basis of carrying an initial pressure of 15 lb at the outlet of the reducing valve and designing the piping system for a pressure drop of 10 lb so that there will still be available a pressure of 5 lb at the end of the piping system. It is, in fact, even practical to permit a pressure drop of 12 to 13 lb on the low pressure system and still have 2 to 3 lb at the last unit.

Frank Tyler
Branch Manager, Herman Nelson Division,
American Air Filter Co., Inc.
Moline, Ill.

In our opinion, use of 100 psi steam pressure for serving unit heaters is an acceptable practice. Most heaters are built to withstand steam pressures up to 150 psi working pressure. Unit heaters operating with 100 lb steam and with 60F entering air has approximately 75% more capacity for the same size heater as compared to the same heater when operating with 2 lb steam. This is due to the higher steam coil temperature. Use of 100 lb steam means small pipe sizes and lower cost of installation.

However, there are disadvantages to the use of high temperature steam. Due to the higher steam coil temperature, the outlet air temperature will be higher and in some areas this may be prohibitive, depending upon the proximity of the workers to the heater discharge. Any piping within reach of the personnel would have to be well insulated to prevent burns. Heavier insulation would be required to reduce losses in the high pressure piping. However, the additional cost of this covering should not be sufficiently high to offset the saving in the difference between low pressure and high pressure piping.

Usually low pressure is used on steam heaters due to the fact that unless a boiler is installed to take care of some industrial processes, the boiler is usually of the low pressure type. For this reason, the greater portion of the heaters are supplied for low pressure systems. The savings in pipe size through the use of high pressure steam is of sufficient importance to merit its use in spite of the added cost for the heavier insulation.

R. W. Morgan
Chief Engineer,
Fedders-Quigan Corp.
Buffalo, N. Y.

High pressure steam, above 30 psi, will shorten the coil life of any unit heater. If the unit is ordered with special heavy tube coil, early failure can be minimized, but the average standard unit heater purchased in the open market will not stand up under 100 psi steam pressure for any reasonable length of time.

Another objection to the use of high pressure steam is the high outlet air temperature from the unit heater. Normal outlet temperatures for the average unit heater are based on 2 lb steam pressure, and high pressure steam increases this outlet temperature to an uncomfortable level. In general, the additional first cost for larger pipe size will probably pay off in the long run, due to the longer life expectancy of the unit heater coil.

N. B. Barsha
Chief Engineer,
Airtherm Manufacturing Co.
St. Louis, Mo.

the ceilings are not excessively high in buildings of this type and therefore, the wasted heat would be minimized.

The disadvantages of using high pressure steam for unit heater installations may be summarized as follows:

(1) The unit heater can be expected to last twice as long on low pressure as on high pressure steam.

(2) The use of high pressure steam accelerates corrosion. Studies show that high pressure steam is responsible for much of the corrosion of unit heater sections, primarily due to the fact that quantities of oxygen and carbon dioxide are liberated by the breaking down of carbonates which occur in steam generation at high pressures.

(3) There is the ever present hazard of seriously burning occupants or damaging stocks in case of a break in the high pressure heating main or release of sprinkler heads if they are located in the high temperature air stream from the unit heater discharge. Although high temperature sprinkler heads could be used, this would greatly reduce fire protection.

In my opinion, it is not good practice to operate unit heaters on high pressure steam, especially when pressures of 100 psi and over are considered. I believe that more economical and satisfactory heating results can be obtained from unit heaters if the initial pressure does not exceed 15 psi. This is especially true in the case of units mounted high above the heating or working zone. In other words, the amount of heat actually delivered to the working zone by unit heaters supplied with high pressure steam (100 psi) is equal to the full capacity of those based on 15 psi. The balance of the heat rises to the ceiling before it reaches the working zone, and is theoretically wasted. It is estimated that approximately 50% of the total Btu output of the unit heater supplied with high pressure steam stratifies and, therefore, is wasted.

However, in some cases such as creameries and small processing plants, where only one or two units are required, it would be impractical to install pressure reducing valves for such a small number of units. Usually

(4) The cost of high pressure fittings and traps is greater than the cost of low pressure accessories, and as with the unit heater itself, maintenance cost may be expected to be higher.

Systems served with low pressure steam will naturally require larger sized mains. However, the size of the mains can be considerably reduced by taking advantage of the maximum allowable pressure drop. Most authorities recommend that the total pressure drop in a system should not exceed 50% of the initial pressure of the system. However, in my opinion, it would be more practical to

limit the total pressure drop of the system to about one-third of the initial pressure on which the system is to operate. For example, if the initial steam pressure in a low pressure heating system is 15 psi, the unit heaters could be selected on 10 psi, and the mains could be sized on a total pressure drop of 5 psi.

This would mean that the units at the end of the steam main would be supplied with steam at a pressure equal to the difference between the initial steam pressure and the total allowable pressure drop, and that the steam pressure supplied to the various units would be increasingly higher as the point of take off approaches the source of steam supply—the boiler or pressure reducing valve.

However, this increased pressure is usually disregarded in making the selection of units, and all units on the basis of final steam pressure available at the end of the supply main.

M. J. Williams
Plan Department,
The Trane Co.

La Crosse, Wis.

The question of whether or not to use the high pressure steam facilities for the unit heaters comes up quite frequently. We have found by experience that it is better to use a low pressure steam, particularly where comfort heating of spaces is required, than high pressure steam of approximately 100 psi or more. The average unit heater on the market is designed for comfort heating, with steam at low pressures and usually where higher pressures are involved, a corrosion problem occurs that considerably reduces the life of the unit. Therefore, the saving in reduced pipe size and unit heater size where high pressure steam is used, would generally not be a saving.

On the other hand, where unit heaters are used in connection with processing, drying, etc., and where it is necessary to use the higher pressures to obtain high temperatures, there is nothing that can be done other than to use the high pressure steam to obtain the temperature requirements. The life of the unit is materially reduced, but this can be charged off to the manufactured process involving the cost of the product.

Where high pressure steam is available and comfort heating is required with the average standard unit heater, we recommend the installation of a pressure reducing valve for the comfort heating section of the system which, in turn, would give a more satisfactory system insofar as air distribution and comfort is concerned and would increase the life of the unit heaters involved.

P. J. Menden
Asst. Sales Manager-Engineering,
Heating, Cooling & Air
Conditioning Division
Young Radiator Co.

Racine, Wis.

New Source for Supply of Activated Carbon

Work on the activation of anthracite was completed at The Pennsylvania State College as part of a cooperative study sponsored by the Anthracite Institute and the Commonwealth of Pennsylvania to develop new uses for anthracite. As a result, the possibility of upgrading substantial tonnages of anthracite fines some 20 to 30 times their present value by conversion to activated carbon was reported in a paper by Dr. C. C. Wright of The Pennsylvania State College at an Anthracite Conference at Lehigh University.

Dr. Wright pointed out that activated carbon can be made from a variety of carbonaceous materials, but that with other materials, a preliminary carbonization step is required to bring the composition to approximately that of raw anthracite. Detailed studies on the activation of raw granular anthracite led to the production of activated carbons comparable in quality with commercial grade products. The possibility of commercial application is under study by at least two industrial organizations.

Applications

Activated carbon is frequently called the universal purifier because of its widespread use as a purification agent. Annual production is almost 100 million pounds, most of which is used in the manufacture or processing of products for human consumption. Among the major uses may be listed: purification of public water supplies, sugars and syrups, edible fats and oils, alcoholic beverages, food products, pharmaceuticals, biochemicals, cleaning solvents, industrial chemicals and the like; recovery and/or purification of gases and vapors in solvent recovery systems, air conditioning systems and industrial gas production; as a catalyst or catalyst support in chemical synthesis.

Large Internal Surface Area

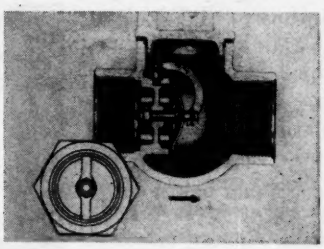
Activated carbon differs from the other forms of industrial carbon principally in that it possesses a highly developed internal surface area, capable of adsorbing different species of molecules depending upon the character of the surface. One gram (1/30 oz) of activated carbon may have a visible external surface area of only a few square inches, but an internal surface area—in the form of submicroscopic pores—of upwards to 20,000 sq ft (almost half an acre). The carbon atoms forming these surfaces differ greatly in their ability to attract and hold other molecules depending upon their own relative position in the molecular or crystallite structure of the matrix. In practice, the character and degree of activity of the developed surface depends to some extent on the starting material, but principally upon the method and conditions used for activation. Thus a carbon activated to have maximum gas absorbing properties may not absorb color bodies from solution because in accentuating the production of the former, the latter was suppressed. These factors must be considered.

NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite page 111 for securing additional information on items described in this department.

Check Valve for Gas Lines

Purchase of the Callahan patent rights covering a horizontal, non-sticking, disc-type, back-pressure check valve for gas lines is announced by Henry Flow Control Co., subsidiary of Henry Valve Co., Melrose Park, Ill. The valve has many industrial and laboratory uses as a safety check valve where gas and air are pre-mixed.



The valve permits unrestricted gas flow at negligible pressure drop with the light weight disc in full open position at pressures as low as 1 inch water column. The ordinary swing type check valve designed for water or steam has a seat disc of relatively great weight and therefore will not open at normal low gas operating pressures. If air back-pressure should exist on pre-mixed air and gas systems, the valve closes and prevents air from entering the low pressure gas distributing lines.

The valve features a spring-tensioned push-rod which holds the aluminum disc slightly off the valve seat except in case of reverse flow. This feature insures gas flow to maintain pilot lights and minimizes the possibility of the disc sticking to the valve seat when oil, tar or other foreign materials are present or after the valve has been closed due to temporary back-pressure.

More information? Circle Item 1 on postcard, page 111

Brazing Alloy for Copper

A copper-phosphorous-silver alloy, Phos-Silver, for efficient brazing of copper, brass and bronze is available from Westinghouse Electric Corp., Pittsburgh, Pa. Extreme fluidity and good wetting properties enable this new alloy to penetrate tight-fitting joints instantly to form strong ductile bonds.

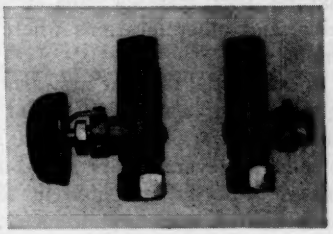
The alloy can be used with any of the common brazing methods for brazing on copper or copper alloys, and is ideally suited for applications where brazing temperatures are critical. On heavy sections that absorb large quantities of heat, its low brazing temperature, 1225 to 1275 deg., substantially reduces brazing time. On fine work or low melting brass, where there is danger of over-heating, it provides an extra margin of safety. No flux is needed in copper-to-copper brazing.

Typical uses are found in the assembly of refrigerating and air conditioning equipment, exchangers, and plumbing installations.

More information? Circle Item 2 on postcard, page 111

Hot Water Valves Save Time

A line of quick acting circulating valves and balancing fittings for forced hot water heating systems is available from Sure Flow Brass Mfg. Co., Brooklyn, N.Y.



The No. 100 quick connecting circulating or convector valve (left) fits directly into the convector with a ½ inch male iron pipe size connection, the other end being a ⅝ inch O. D. compression joint for ½ inch copper or steel tubing. Consequently, no tail piece, coupling nut or soldering is required, thus saving time and material.

The No. 101 quick connecting balancing fitting (right) is ½ inch male iron pipe size at one end and ⅝ inch O.D. compression fitting for copper or steel tubing at the other end. Here, too, no soldering is necessary. The valves are available through jobbers.

More information? Circle Item 3 on postcard, page 111

Equipment Mounting Shock Pads

Worthwhile economies in installation and maintenance of machinery can be achieved by a new method of mounting which eliminates bolts and reduces shock, vibration and noise, according to L. H. Gilmer Co., Division of U. S. Rubber Co. Philadelphia, Pa.

The new method is made possible by use of Gilmer shock pads, which have effected savings in installation time up to 90% in some applications, in addition to the benefits accruing from quiet, vibrationless operation.

In construction the pads are sandwiches of neoprene between two layers of heavy cotton duck. Machines are mounted on the pads with a specially developed rubber-based adhesive, which makes a tight, enduring bond on concrete, wood, metal or tile. Both pads and adhesive are resistant to oil, heat, water and cleaning compounds, while the adhesive (fabric pad to metal) has a shear strength of 220 psi and a tensile strength of 120 psi. Although the bond will last for years, the pad may be removed easily by prying up one corner and peeling it off.

The pads are made in standard thicknesses of ⅜, ½, and ¾ inches for static loads of 50, 70, and 100 pounds per square inch. Special pads 1/4 and 5/16 inches thick have also been developed. Under tests the pads have withstood static loads of twice their rated capacity with no appreciable loss in efficiency or useful life.

The material is available in stock sizes as well as in sheets ranging from 2 to 22 inches wide and in any desired length, so that pads may be cut to size as needed.

More information? Circle Item 4 on postcard, page 111

Smaller Automatic Ice Maker

The Carrier Cub automatic ice maker, announced by Carrier Corp., Syracuse, N. Y., will make 200 pounds of cubes or crushed ice daily. It is built to specifications set up by hundreds of interviews with operators of hotels, restaurants, hospitals, taverns, supermarkets, meat markets, drug store fountains, and other locations where ice is employed.

A substantial number indicated a definite need for a machine similar to the company's 450 pound a day ice maker, introduced several years ago, but in a smaller capacity and able to fit even more limited space requirements.

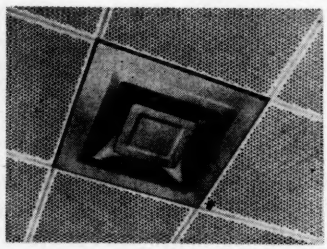
The new machine may be obtained in a combination model with a factory built-in crusher for production of either cubes or crushed ice at the turn of a knob. Models of this type are supplied with a divided bin, and the machine automatically deposits cubes in one section and crushed ice in the other. Three grades of crushed ice from fine to coarse are available through a simple turn of another knob. The machine produces only the amount of ice needed, shutting itself off when the bin is full.

The ice makers are available in three sizes, with 100, 160, or 240 pound storage bins. With the 100 or 160 pound bin, the ice maker occupies a space about two feet square.

More information? Circle Item 5 on postcard, page 111

Square Diffuser, 4 to 14 In.

A new square diffuser, styled for acoustic-type ceilings and designed to retain the characteristic advantages of its circular Kno-Draft outlets, is announced by W. B. Connor Engineering Corp., Danbury, Conn.



Although rectangular in appearance, this square diffuser is said to be the first such device to discharge supply air in the effective, single-stream, circular pattern which produces rapid entrainment or mixing with the room air. Geometrically proportioned, it is also said to be the first square design to have identical discharge characteristics in all sizes. For example, at constant neck velocity the resistance or static pressure required for either a 4 or 14 inch unit will not vary. Hence uniform diffusion over a large area is assured.

These new units are made in neck sizes from 4 to 14 inches, either to overlap or snugly fit the individual tiles. Complete dimensions are contained in Bulletin K-27.

More information? Circle Item 6 on postcard, page 111

Expansion Joint for Baseboards

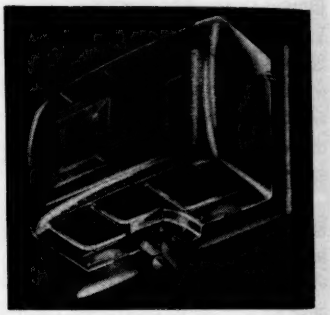
The XPanso joint for hot water heating systems using baseboard radiation has been introduced by General Automatic Products Corp., Baltimore, Md. This joint counteracts the expansion and contraction of the copper heating element with its accompanying objectionable noises.

This unit when installed in the line, will allow for the expansion and contraction of the heating elements, minimizing creep, assuring a quiet performance. It is manufactured for ¾ inch O.D. tubing only.

More information? Circle Item 7 on postcard, page 111

Plastic Case Guards Thermostat

Curiosity can now be delicately curbed so far as inquiring fingers poking into thermostats are concerned, according to Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., which has introduced a streamlined clear plastic guard for its electric clock thermostats that enhances the beauty of the devices but actually serves a more practical purpose — to prevent tampering.



It was designed in answer to a demand from apartment house owners, store managers and other operators of public places where thermostats are installed within reach of prying fingers.

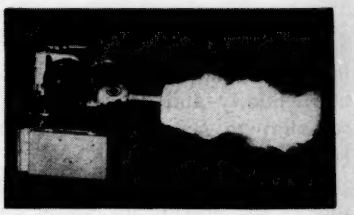
The transparent face allows the clock and thermometer to be seen, and large openings on top and bottom permit free flow of air into the control. Clock and thermostat settings are fully protected by the guard, which is equipped with lock and key.

More information? Circle Item 8 on postcard, page 111

Improved Commercial Burners

Two new models of commercial oil burners have been added to its line of industrial and commercial burners by Cleaver-Brooks Co., Milwaukee, Wis. They are known as the AM5-H and the AM6-H models.

The former, which has a capacity of 25 gallons per hour, has an overall width of 20 inches instead of 31 inches, enabling more practical side-by-side installations. Height of the center of the combustion cone to the floor has been reduced to 8½ inches, making it unnecessary to pit in front of the boiler on most jobs. A switch panel box is included.



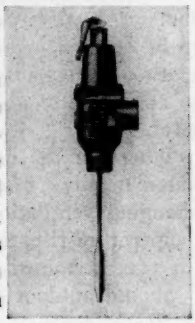
A convenient feature is a separate tank to hold the oil used to lubricate the air pump. Power losses and lack of air due to belt slippage are averted by use of a direct connected pancake motor. Use of an electronic relay provides safe flame failure protection.

The AM6-H, with a maximum capacity of 40 gallons an hour, uses a larger oil pump and air diffuser.

More information? Circle Item 9 on postcard, page 111

Multi-Size Line of Relief Valves

Availability of a complete new line of combination temperature and pressure relief valves in what is said to be the largest selection of sizes and discharge capacities ever offered, is announced by Watts Regulator Co., Lawrence, Mass. The new series is designed around a new thermostat.



The new thermostat is of solid copper wall construction and operates on a piston principle. It is impervious to corrosion, and there is no flexing of thin metal parts to limit its strength. The bulk of its thermal fluid fill is concentrated in a bulb at the lower end of the thermostat, where it can be influenced directly by the actual tank temperature. The expansion energy, which takes place in the bulb is transmitted through a capillary tube to the piston, which lifts the disc from its seat.

The new valves are available in three models:

(1) The N40 series, intended for home and small installations and having a heat input up to 500,000 Btu per hour. Design includes a diaphragm pressure seal to protect working parts from the water. They are provided with ¾ inch male inlet and ½ inch female drain connections.

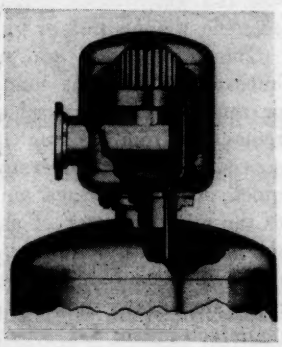
(2) The model 240 (illustrated) with the same features except that No. 240 is larger to protect systems having a heat input up to 1,000,000 Btu per hr. A feature is the replaceable thermal element that may be installed without removing the valve from the tank or disturbing the temperature adjustment. It has a male inlet connection, a ¾ inch female drain, and is rated at 1,000,000 Btu per hr.

(3) Model 340 is a large capacity, pilot operated temperature and pressure relief valve for the largest institutional, industrial, and commercial domestic hot water supply storage systems. The tested capacity is 3,000,000 Btu per hr. Construction is all bronze with brass internal trim and includes the new thermostat. Available in one style with 1½ inch male inlet and 1 inch female drain connections.

More information? Circle Item 10 on postcard, page 111

Internal Downflow Purifier

Dirt, moisture, riser discharge and solids are removed before passing on to the distribution piping when the Internal Downflow Hi-eF purifier, made by The V. D. Anderson Co., Cleveland, Ohio, is installed in an auxiliary tank immediately above evaporators, packed towers, deodorizers, stills, bubble-cap towers and inside steam drums, flash tanks, receivers and other vessels.



These purifiers serve numerous functions, depending upon the application. They increase heating efficiency and protect pipeline equipment in steam application. In chemical and petroleum vessels they recover valuable vapors. They increase production in evaporator operation, and in food processing produce a better product.

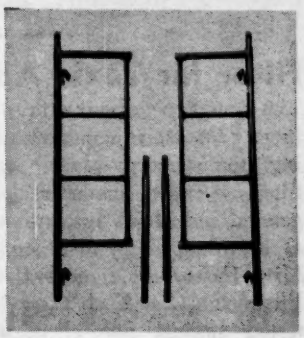
Hi-eF Purifiers carry a guarantee to deliver vapor with 1.0 ppm or less of total solids. In other applications the purifier is guaranteed to remove 99% of all entrainment. A feature of these units is the separating element so designed that the units maintain a constant separating efficiency even as velocities become greater.

Removal of foreign matter is accomplished by means of a multi-stage centrifugal element which engages the entrainment laden vapor at the inlet at the top of the purifier as far away from the liquid level in the drum as possible. In three stages by means of carefully controlled centrifugal force practically all dirt, moisture and riser discharges are removed.

More information? Circle Item 11 on postcard, page 111

Scaffold Frame Fits Inside Tank

A demountable scaffold end frame, No. 155-X, that may be disassembled and passed through small openings for scaffold erection in water tanks, oil tanks, blast furnaces, boilers and similar jobs where entrance space is limited, has been developed by Wilson-Albrecht Co., Inc., Minneapolis, Minn.



Measuring 5½ ft. high and 5 ft. wide, the end frame demounts quickly into four sections, two upright and two cross members. The largest of these are 5 ft. 4½ inches long and 18 inches wide, permitting entrance through a small aperture. Assembled, the members are held rigidly in place by coupling pins and toggle pins. The frame is equipped with the standard Waco Speedlock for safety and speed of erection. Construction is of welded tubular steel.

This frame was used to scaffold the interior of a 100-foot water tank in Ohio recently where entrance was restricted to a 2½-foot diameter opening. According to the company's job reports, the scaffolding was passed into the tank and erected in one-fifth the time estimated necessary to duplicate the job using previous methods.

More information? Circle Item 12 on postcard, page 111

Acid Resistant Plastic Packing

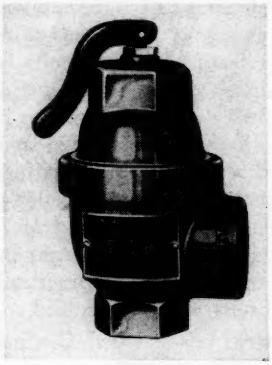
An extruded Teflon plastic packing, No. 403, designed for difficult packing applications, is introduced by Flexrock Co., Philadelphia, Pa. It is for use in centrifugal pumps handling acids, caustics and hard-to-handle solvents.

The packing is composed of shredded Teflon, blue asbestos, combined with suitable binders and lubricants, extruded into an open cotton yard jacket, which confines it and makes installation easy.

More information? Circle Item 13 on postcard, page 111

High Capacity Relief Valve

The No. 46 safety relief valve has been announced by H. A. Thrush & Co., Peru, Ind. It has a rated output of 283,500 Btu per hour based on steam capacity discharge.



Designed to conform to the ASME code, the valve is primarily a water relief valve designed to serve double duty of relieving water as well as steam should critically high temperatures occur in a hot water heating system.

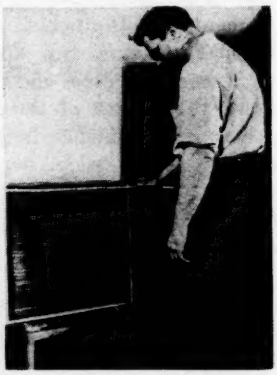
The materials of which this valve is made are designed to withstand high temperatures. A specially designed metal diaphragm insures long life and greater protection.

The valve sells for little more than a regular water relief valve. Has ¾ inch inlet and 1 inch outlet, handy testing lever and large readable nameplate. Factory set at 30 lbs pressure, nonadjustable.

More information? Circle Item 14 on postcard, page 111

Filter for Toxic Applications

A new type of air filter, developed originally to remove radioactive contamination from air exhausted during atomic energy plant operations, the Ultra-Aire space filter, is now available for general industrial, institutional and laboratory use from Mine Safety Appliances Co., Pittsburgh, Pa. Each filter is tested against fine chemical smoke and is certified to be at least 99.95% efficient against particles as small as 0.3 micron (about 12/1,000,000th of an inch) in diameter. In practice, the filter removes particles as finely divided as tobacco smoke, particles of which range from .05 to .1 of a micron.



Simple in design and construction, the filter has 46,000 square inches of filter media in the 1000 cfm size, and is available in air flow sizes of 50, 500 and 1000 cfm. Its effective service life, when protected by a roughing filter, is about a year and a half.

The filter is said to have many applications where toxic and radioactive particles are a threat to health or production processes. In hospitals, it safeguards against bacteria and some virus when they are air-borne in operating rooms, isolation wards, and experimental laboratories. Producers of pharmaceuticals are told the filter prevents product contamination in processes where air conditioning is vital to manufacturing. It can be made a part of an air conditioning system, either in the intake or exhaust.

Bulletin No. CU-4 is available.

More information? Circle Item 15 on postcard, page 111

Automatic Cooling Balancer

An important advancement in room air conditioning, modulation control, is announced by York Corp., York, Pa. Described as a personal comfort balancer, modulation control is a system capacity adjusting device for automatically preventing a room air conditioner from over-cooling when outdoor temperature drops.

Its operation is this: A simple dial located on the cabinet of the unit permits the desired amount of cooling to be selected. After the air conditioner is started, modulation control automatically adjusts the cooling capacity to avoid over-cooling and maintain the selected comfort level.

Whenever the outside temperature drops, the control automatically reduces the amount of cooling without changing ventilation or air circulation. Should outside temperature rise, the control then increases cooling until the predetermined comfort level is attained.

Should outdoor temperature change, the control automatically steps-up or reduces the cooling capacity. In either event the room conditioner will continue removing humidity without changing ventilation or air circulation.

An optional accessory for its ¾ hp room air conditioners, the control will retail for about $20. It is standard on the 1 hp models.

More information? Circle Item 16 on postcard, page 111

Gas Water Heater Control

A new gas control for domestic water heaters providing close, even water temperature control with complete safety in operation, is announced by A-P Controls Corp., Milwaukee, Wis. Known as the Model 50 Gasapack, the unit is completely self-contained. It comprises built-in main and pilot cocks, pilot filter, 100% automatic, 100% shut-off safety pilot and an automatic main valve.

Water temperature is regulated through a contact-type thermo bulb, which is fastened against the water tank, and which eliminates the necessity for a spud inserted into the tank. Since there is no spud joint, there is no possibility of water leakage at this connection, and since there is no connection whatever between the bulb and the water in the tank, there is no danger of water entering the gas line or vice-versa.

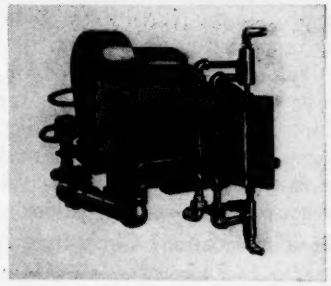
The control unit and main burner can be mounted integrally, so that the complete assembly can be installed or removed and serviced as a unit. All gas orifices are removable from the front, to facilitate service. An easily accessible water temperature adjustment lever aids in quick, accurate settings, and a 3 cu. ft. pilot filter reduces to the minimum risk of shut-down due to impurities in the gas. In case of failure, the unit will fail safe.

The unit can be positioned anywhere, inside or outside the water heater housing. It can be used on natural, manufactured or L-P gases.

More information? Circle Item 17 on postcard, page 111

Horizontal Rotary Oil Burners

The rotary oil burners originally manufactured for use with its steam generators are now available for conversion and replacement use as well as for new installations in the commercial and industrial fields, according to Superior Combustion Industries, Inc., New York, N. Y. Arrangements for national distribution are being made with installing dealers in major cities throughout the country.

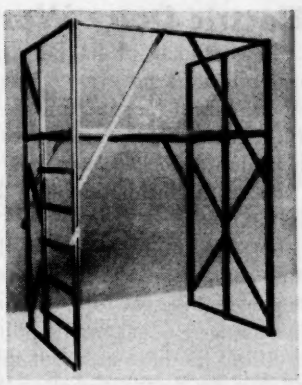


Features of the burners as listed by the manufacturer include V-belt drive for high cup speed essential to efficient atomization; four-hole hinge circulates oil through oil heater so that oil is on the pressure side of the pump, allowing oil to be burned at high temperatures; adjustable air nozzle provides accurate control of flame contour; dual pumps and reservoir combined with constant oil rate control provide controlled firing regardless of viscosity variation; will burn any grade of oil, or is available with combined gas burner for any type of gas, and fully automatic in sizes to 500 bhp with dual ignition, and high-low or fully modulating control.

More information? Circle Item 18 on postcard, page 111

Framing Material for Supports

A steel framing material called Mult-A-Frame, has been developed by Ainsworth Mfg. Corp., Detroit, Mich. It consists of three basic units with which can be built equipment that can be dismantled, adapted, or converted without scrapping to meet new and different uses. In addition to its applications by industry for production, storage and maintenance needs, it is also intended for use by contractors.



The material is bought in standard lengths, cut with a saw, and assembled with a wrench. It is then easily and quickly dismantled with the same wrench for moving, converting to new uses or storing for future use. It is a safe, fully-locking framing material that provides strength without bulk and with only half the weight of angle iron. The three basic units are channel frame, spring tee bolts and safe-locking fittings.

The channel frame comes in several sizes and weights that may be used in combination. It also comes in multiples of two, three, and four members welded to provide greater column and beam load and additional bolting capacity in any direction. Each has a one-half inch continuous slot on one side with easy-to-work-with flat surfaces. Edges of slots have serrations that provide 1/8 inch adjustment for locating and positioning the inside members.

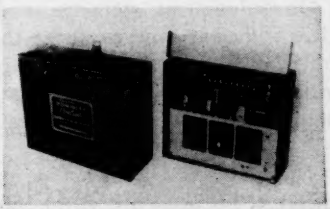
The bolts are one piece, cold-forged, stress-relieved. Bolt head is rectangular in shape with a coil or zee-shape leaf spring on top and four contact points on the underside located at each corner. The fittings are stamped from 3/16 inch steel plate, same width as channel frame on slot side. Hundreds of special fittings are available.

Among the applications are racks for pipe, supports for conduit, pipe, ducts, radiators, heaters, etc.

More information? Circle Item 19 on postcard, page 111

Electronic Humidity Control

An electronic humidity control, two-position or proportioning, humidifying or dehumidifying, for process or comfort control, and which features super-sensitive, instant response with plug-in element, wide range, and simple adjustments, is announced by Barber-Colman Co., Rockford, Ill.

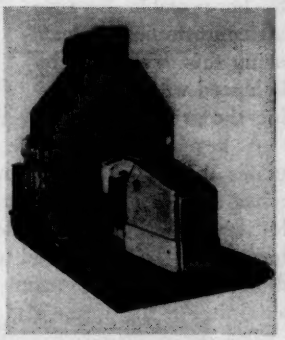


Moisture-sensitive element changes resistance instantly with minute changes in relative humidity. In spaces supplied by a central fan, the sensing element is mounted either in the duct or the conditioned space, remote from the amplifier and adjustments. For controlling the relative humidity in spaces not completely air conditioned, the highly sensitive aspirating type control is available with all operating adjustment mechanisms mounted in a convenient cabinet.

More information? Circle Item 20 on postcard, page 111

Portable Stoker-Heater Unit

A portable stoker fired unit heater has been placed on the market by Arthur A. Olson and Co., Canfield, Ohio. This heater, with a high output, was especially designed to provide spot heating for specific areas in large warehouses and mills. The heater can be moved easily from place to place as needed, without dismantling any part, and still offer all the efficient features of the permanent base heater.



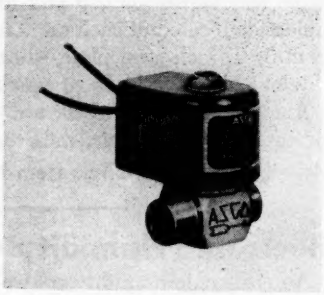
The unit pictured is for either bituminous or anthracite coal. The portable units are also furnished with either oil or gas burning equipment.

The heaters are delivered completely assembled, with stoker and refractory secured in place. They are ready wired and ready for operation. The base acts as a sled for moving as well as a convenient storage space for ashes.

More information? Circle Item 21 on postcard, page 111

Time Delay Shut-Off Valve

A midget solenoid shut-off valve with time delay mechanism which holds back the flow of liquid or gas through the valve for approximately 5½ seconds after the solenoid becomes energized, is announced by Automatic Switch Co., Orange, N. J. This feature makes the valve useful in oil burner applications where it is desirable to have instant combustion. The time delay mechanism holds back the flow of oil until a full stream of air, sufficient to make a perfect combustible mix, is flowing through the burner.



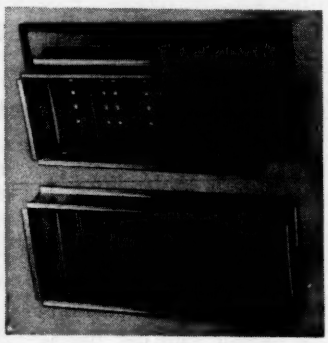
On subsequent stoppage and re-lighting, the delay gives sufficient time to purge the fire box of old fumes and smoke. The valve can be installed in any position without affecting the time delay action. Shut-off is instantaneous and positive. Overall size, top to bottom, is 2-13/16 inches.

The valve has ⅛ inch pipe connection and full 1/16 inch port for pressures up to 150 pounds with 15 gallons per hour flow.

More information? Circle Item 22 on postcard, page 111

Quick Change Volume Control

A new type air volume controller, the AG-35, that can be adjusted in one-tenth the time it takes to adjust a conventional grille and volume controller is announced by Titus Mfg. Corp., Waterloo, Iowa. Great savings in time and labor are said to be possible because air conditioning systems using this device can be balanced without removing the grille.



A key operator regulates the air volume from the front of the grille. Another feature is the manner in which the volume control louvers close. The louvers do not close flat but at 45° (see lower photo). This is said to maintain a metering control down to the final moment of closure, thus maintaining a minimum disturbance of the air pattern.

The device can be specified as a single unit or combined with any Airfoil grille as a one unit combination.

More information? Circle Item 23 on postcard, page 111

Deaerator-Expansion Tank

A De-Airator tank for forced hot water heating systems has been introduced by General Automatic Products, Corp., Baltimore, Md. It differs from the conventional basement expansion tank since a separator plate in the center of the tank actually provides two independent tanks.

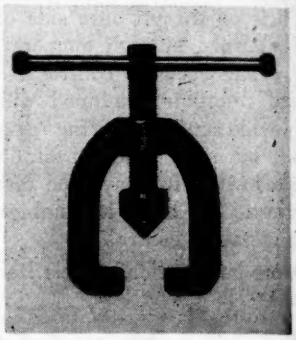
One of the tanks is piped in the feed or supply line leaving the top of the boiler and effectively removes gases and vapors from the water leaving the boiler. The other tank is piped into the return line, and removes air entrapped in the return water. Both tanks serve as expansion tanks as well as de-aerators.

Automatic feed and relief valves are part of the tank unit; so are key-type air vents, used to balance the relationship of air to water in the tanks. In forced baseboard or convector systems, use of air-relief valves is eliminated. In normal convector systems, it will eliminate air clogging of convectors to a large extent.

More information? Circle Item 24 on postcard, page 111

Ball Bearing Flaring Tool

A ball bearing swivel head is now featured on the heavy duty and standard models of flaring tools made by Talon Tools, North Arlington, N. J. Flares are made with half the effort required with fixed head tools, friction is reduced, strain and cracks at the lip of the tubing being flared are eliminated.

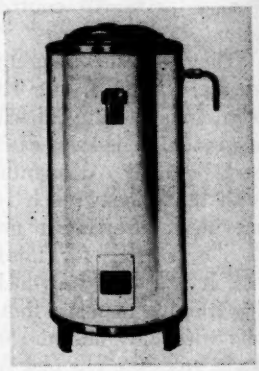


Another advantage of the ball bearing head is that metal chips, dirt, and foreign matter are pushed aside and cannot be ground into the flared surface, as is common with the fixed head. The tool is permanently grease packed and sealed at the factory.

More information? Circle Item 25 on postcard, page 111

Electric Dairy Water Heater

New models of its Permaglas portable electric dairy water heaters have gone into production at the plant of A. O. Smith Corp., Kankakee, Ill. A feature is the molded rubber double-locked vapor seal between the inside tank and the jacket.



The weight of water in the tank compresses the rubber and improves the seal to give positive assurance that water spilled in filling the heater cannot find its way inside the jacket to the thermostat or heating element. In field tests, no cases of moisture penetration were found.

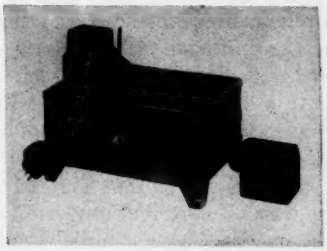
Other changes include a new-type *S* cord, which assures longer cord life, and a change in base design from four to three legs to minimize leveling problems.

The heaters are for use in the milk house, farm kitchen, summer cottage, laundry, rural store, service station, hunting lodge or trailer.

More information? Circle Item 26 on postcard, page 111

Portable Condensate Pump

A high efficiency, portable, low price automatic condensate pump has been developed by Samuel S. Gelber Co., Chicago, Ill. The tank has a capacity of 5 gallons and has a 5/8 inch OD tubing outlet to which is coupled an all rubber bantam size centrifugal pump of 1/35 hp.



The pump has a synthetic rubber impeller molded to a stainless steel shaft. It has a flooded suction and never requires priming. Wide clearance and other nonclogging features permit solids to pass through without stalling the motor. It has a capacity of 450 gallons of liquid per hour at 2 feet to 168 gallons per hour at 8 feet.

The automatic pump control consists of a heavy-duty micro-switch actuated by a copper float inside the tank. Either 3/8 inch standard water pipe, 5/8 inch OD rubber tubing or standard 5/8 inch garden hose can be used in the discharge outlet.

More information? Circle Item 27 on postcard, page 111

New Heavy Fuel Oil Filter

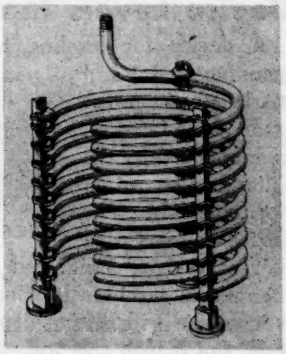
To meet the demand for a low-priced, heavy-fuel-oil filter, General Filters, Inc., Detroit, Mich., has announced its Model 2A-17. It is specifically engineered to use with number 4, 5, or 6 fuel oils.

The new model has a rating of 30 gallons per hour. Inlet and outlet openings are tapped for 1/2 inch pipe threads. With only two connections to make, installation is simple and can generally be done in a matter of minutes. To clean the filter element, it is necessary only to remove one center bolt, lift out the element, and clean in any suitable solvent.

More information? Circle Item 28 on postcard, page 111

Pipe Supporter for Lead Coils

The Universal pipe supporter is under production by Knapp Mills, Inc., Long Island City, N. Y. The supporter is designed to correct a handicap in the employment of lead heating and cooling coils, as required in the processing of a variety of corrosive acids.



It has been standard practice to fabricate such coils with solid lead legs, which act to separate the pipe turns and also tie the coils together so as to give them suitable legs or supports. This procedure solves the corrosion problem, but the legs are extremely heavy, the cost is considerable, and the legs frequently buckle, distort and tend to collapse. The solution was the employment of Ferrolum lead clad steel for coil legs.

The Universal pipe supporter coil legs consist of four components, and angle or bar for the leg, a stand to support the leg, a cradle to support the pipe turn which is self-locking, since the weight of the pipe tilts the cradle and causes it to freeze in place, and a wedge which further secures the cradle and makes permanent the spacing of the pipe turns.

Since the Ferrolum cradles may readily be slipped on and positioned to the legs, it is evident that the components are suitable for any pipe coil. The number of legs depend, of course, on the dimensions and weight of the coil under discussion. Lead burning has been completely eliminated.

The cradles are made in two sizes which will accommodate diameter of pipe from 1 to 2½ inch O.D.

More information? Circle Item 29 on postcard, page 111

Temporary Use Space Heater

A portable space heater for temporary heating has been introduced under the name Sonic-Ray heater, by Bica Co., Girard, Ohio. It burns propane gas, and has an output of from 85,000 to 150,000 Btu per hour. The heater operates from 40 to 63 hours on a 100 lb. tank of gas, and is said to cost an average of 11 to 17 cents per hour to operate.

The unit was particularly designed for use in construction projects, for warming personnel and warming and drying building products. It is also being used successfully for space heating in camps, industrial plants, warehouses, and foundries.

The heater is 31 inches high and weighs 31 pounds. It sells for $29.95, or can be ordered with special equipment for continuous unattended indoor operation for $44.95. All units come complete with pressure regulators and hose for connection to any propane tank.

More information? Circle Item 30 on postcard, page 111

Commercial Vacuum Cleaner

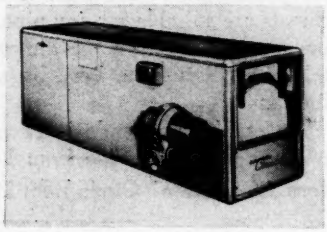
The Alaco commercial vacuum cleaner is announced by The Ace Company, Ocala, Fla. This cleaner has a capacity of 10 gallons or 1¾ bushels and sufficient suction to pick up anything that will pass through the hose quickly, including solids as well as water or other liquids. There is an attachment for every commercial cleaning need.

Device is equipped with a 1 hp universal motor; filter is enclosed, dust proof and easily removed. The machine weighs 39 lb and is equipped with a 35 ft approved cord and plug. It is 30 inches high, mounted on hard rubber, noisless casters, and has a low center of gravity.

More information? Circle Item 31 on postcard, page 111

Oil-Fired Horizontal Heater

The Type 253 horizontal oil-fired winter air conditioner or unit heater for residential or commercial installations is introduced by L. J. Mueller Furnace Co., Milwaukee, Wis. It may be suspended as a unit heater in garages, shops, schools and other commercial installations or it may be used for all types of residential installations. In homes, it can be set on joists or hung from rafters in the attic, or may be installed in the crawl space, basement or in a closet.



Currently the unit is being made in one size, 110,000 Btu per hour input, but will shortly be available with inputs up to 225,000 Btu per hour. The unit is completely up-draft in design, and may be converted to gas with a gas package.

Features include large multi-blade centrifugal type blower which operates at low speed, heat exchanger of heavy gage welded steel, and which provides long flue travel, and cleanout patches to provide access to the interior of the radiator and the back portion of the heat exchanger drum. These patches have a welded lip and are lined with asbestos gasketing to insure gas-tight fit.

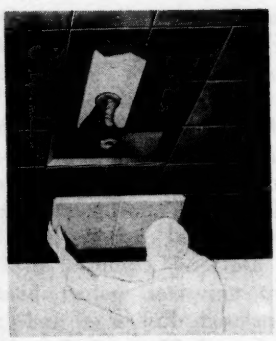
Flue outlet is at the back to provide for a more attractive installation and permit close-to-ceiling installation for more head room. Unit also has an observation port which also serves as a pressure relief door. It is covered with a cast iron cap.

The unit is available with either of two efficient pressure atomizing Mueller burners.

More information? Circle Item 32 on postcard, page 111

Diffusers for Acoustical Ceilings

A new type of ceiling air diffusing panel, the Modular Multi-Vent, for heating, cooling and ventilating systems using either duct or plenum air supply, is now available from Multi-Vent Div., The Pyle-National Co., Chicago, Ill. This modular panel air diffuser is primarily designed to reduce to a minimum the cost of installing an air distribution system in acoustical metal pan ceilings. It can be incorporated into metal pan ceilings at a low cost, and has important performance, appearance and maintenance features.



The panel delivers conditioned air at low velocities and accomplishes over-all air distribution entirely by pressure displacement. Therefore, there is a total absence of strong air streams or blow and problems of outlet location and air direction adjustments for throw and drop to avoid drafts are said to be eliminated. Since no air movement in excess of comfort zone requirements exists more than 6 ft away from panel, panels can be located anywhere in the ceiling to efficiently meet load conditions, regardless of ceiling heights. The proximity of seating locations or the relative positions of walls, columns, lighting fixtures, etcetera, need not be considered.

The unit is an assembly of a lightweight panel, 12 x 24 inches; an orifice valve which is adjustable with a wing nut; a flexible and compressible fibre-glass tubing for connecting panel with air supply duct. The panel fits into any standard make acoustical metal ceiling pan. This perforated ceiling pan with acoustical pad removed functions as the distribution plate for the panel.

Ductwork is substantially reduced. Ducts can be shop built and precut with 3 inch diameter holes for the flexible tubing connections. This flexible connection between duct and panel eliminates need for turn-down collars.

Ductwork is installed and finished prior to and independent of ceiling construction. The flexible tubes are snapped into duct openings and system is balanced by adjusting valves in the end of each tube, before the ceiling contractor moves on to the job.

The panels are attached to the flexible tubes by a twist of the bayonet lock on the tubing collar. The panels align themselves in the designated ceiling pan, simply replacing the acoustical pad. The individual ceiling pans which contain the panels snap into the tee runners in exactly the same way as the pans which contain acoustical pads.

More information? Circle Item 33 on postcard, page 111

6-12.5 Gal. Oil Burner Modified

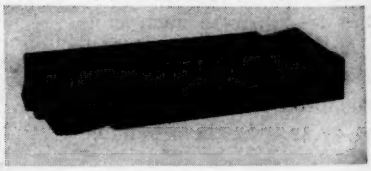
The Model TMJ oil burner, with a capacity ranging from 6 to 12.5 gallons, is now available with a 6 inch extension, which permits the burner to be installed in large boilers and allows the fire door to be open for flame inspection, according to the maker, Electrol Burner Manufacturing Co., Inc., Rutherford, N. J.

This semi-commercial burner will be furnished with a double extended cutoff valve with a monel needle seating directly in back of the dual nozzles. This construction, in conjunction with the magnetic valve provided, insures instant cutoff on burner shutdown and prevents after drip of oil and carbonization of the nozzles.

More information? Circle Item 34 on postcard, page 111

Device Levels Machinery

A device for leveling heavy machinery and being manufactured and marketed under the trade name Lev-Ler, is annuonced by the Filter & Injector Co., Springfield, Mo. The device consists of a pair of wedges engineered to assure easy, accurate and economical machine leveling. The device is available in 6 inch size with lifting capacity of approximately three tons, and 8 inch size with five ton lifting capacity.



They are self-locking under load.

More information? Circle Item 35 on postcard, page 111

(*Continued on page* 108)

NEW WAREHOUSE AND SHIPPING CENTER
"JUNKET" BRAND FOODS
LITTLE FALLS, N. Y.

ANOTHER CASE OF *Copper* WHERE IT COUNTS!

During the winter months there will be no snow or ice troubles at the truck entrance of the new "Junket" Brand Foods Warehouse. A snow-melting system of Revere Copper Water Tube in the 20′ x 60′ concrete slab sees to that. This building, erected prior to the copper shortage, was designed by Architects, Bagg and Newkirk. Heating Contractor was H. J. Brandeles Corp. Revere Copper Water Tube was supplied by the Crane Co., all of Utica, N. Y.

The contractor found the light-weight, 60′ length coils of Revere Copper Water Tube easy to handle and install. Also, its soft temper permitted bending, reducing the number of fittings used. Other features that architects, contractors and builders like about Revere Copper Water Tube are: Because it is non-rusting it will last indefinitely . . . the solder or compression fittings used make it possible to use a thinner wall tube than is possible when threaded fittings are used, with a substantial saving in metal.

Next time you build, plan, specify or make an installation, make sure Revere Copper is used in the spots where enduring performance counts most. The architects, contractors and builders who do have found that it pays dividends in prestige, reputation and customer satisfaction.

See your Revere Distributor. He will advise you of the availability of materials and, in the event you wish to discuss your technical problems, put you in touch with Revere's Technical Advisory Service.

GUIDE PLANK is used by workman to facilitate installation of 1" Type K soft temper Revere Copper Water Tube. Revere Tube also comes in hard and soft tempers in straight lengths of 20 ft.

LARGE PHOTO ABOVE shows Revere Copper Water Tube in place ready for pouring concrete.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

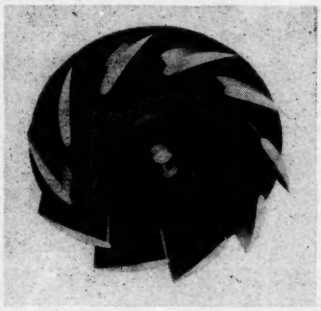
Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

SEE REVERE'S "MEET THE PRESS"
ON NBC TELEVISION EVERY SUNDAY

(*Continued from page* 106)

Airfoil Centrifugal Fan

A new type non-overloading, centrifugal fan that is over 90% efficient with only one third of the noise intensity of previous models is available from Sturtevant Div., Westinghouse Electric Corp., Boston, Mass.



Designed especially for industry, power, and commercial building needs, the new fan ranges in wheel sizes from 40¼ to 108¾-in. diameter and is capable of delivering volumes of up to 600,000 cfm.

The new airfoil blade design, along with simultaneous aerodynamic changes in inlet and casing, has boosted mechanical efficiency at peak to 92%. There has also been a reduction of five decibels in the noise intensity level.

It is recommended wherever high efficiency and low sound level are prime considerations, and, hence, the higher initial cost can be justified by an evaluation of lower operating costs.

More information? Circle Item 36 on postcard, page 111

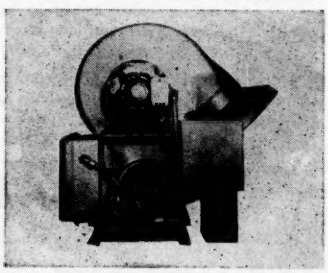
Motors for Gate Valves

A complete new line of automatic gate valve motors especially designed for use in connection with gate or angle valves in pipelines carrying very high pressures is announced by Janette Electric Mfg. Co., Morton Grove, Ill. The motors range from 1/3 to 10 hp plus a special line ranging up to 50 hp.

More information? Circle Item 37 on postcard, page 111

Industrial Electric Heater

A forced air 440-volt electric heater for industrial use is available from Kilbury Mfg. Co., Lawndale, Calif. It is a complete heating plant in a small package about 2 feet square and weighs approximately 100 lb. Rated at 13.1 kilowatts, it develops a heat output of 45,000 Btu per hour and is suitable for heating small shops or may be used for processing applications or as a portable heater for spot heat.



In combination of multiple units the heater will take care of heating large plants when used for zone heat, perimeter heat, loading dock heat, auxiliary or supplemental heat. Equipped with automatic temperature controls and built-in-safety switches and fuses, the electric heater requires only a suitable power supply to operate. It may be installed on incombustible, fire-resistant flooring or suspended and can be used with or without ducts. Angle iron brackets are used for wall mounting.

The heater consists essentially of ceramic core heating elements, 115-volt motor operated blower, and associated control equipment. The control circuit is comprised of a transformer, 115-volt thermostat, gang of micro-switches operated by means of a solenoid, high-temperature cutout, circuit breaker to protect primary winding of transformer and fuses to protect motor and solenoid. Blower moves 300 cfm.

More information? Circle Item 38 on postcard, page 111

36 In. Cast Aluminum Fan Blade

To increase air flow with either circulating or exhaust fans in industrial installations, the Kloppenborg Aluminum Foundry, Davenport, Iowa, has added a new 36-inch one-piece cast aluminum blade to its line.

With the new blade, the company's line of fan blades now ranges from 12 to 36 inches with capacities from 1,255 to 14,900 cfm.

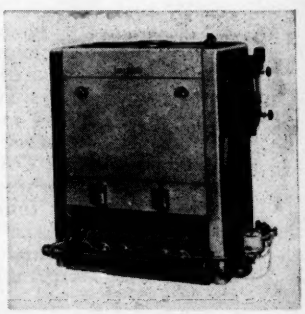
The aluminum fan blade is of one-piece cast construction and can be balanced accurately. With these features, the blade has a long life with continued efficiency.

The blades are bored to electric motor shaft specifications. They have two hollow set screws which simplifies mounting for maintenance men.

More information? Circle Item 39 on postcard, page 111

Water and Steam Gas Boilers

The type H series gas fired boiler for hot water and steam heating has been introduced by Weil-McLain Co., Michigan City, Ind. It is available in seven sizes with capacities ranging from 144,000 to 432,000 Btu per hour gross output or 720 to 2,160 square feet of water net connected load.



Features of the boiler are large size supply tappings to simplify piping installation and assure dry steam; individual tie rods which shorten boiler assembly time and equalize stress on all sections, and attractive gray and blue insulated steel jacket.

Boiler controls are mounted in a convenient location well protected from boiler heat by insulation. Observation ports on the front base panel allow direct view of burner flame for proper adjustment. A dual pilot orifice minimizes the effect of linting and assures a constant pilot flame.

Technical bulletin T-147 is available.

More information? Circle Item 40 on postcard, page 111

(*Continued on page* 110)

The HIGH-STRENGTH SHEET *is Galvanized Steel*

Of all the materials used for ordinary sheet-metal work, steel is the strongest and stiffest.

This means that galvanized steel has less tendency to buckle or kink when it is handled. It usually requires less bracing or stiffening, and can be used in longer sections than sheets made from other metals. Steel sheets also have more resistance to damage from denting or punching.

Bethlehem Galvanized Sheets are made of strong, durable steel, either plain or copper-bearing. Added to this steel is an adequate coating of zinc to guard against corrosion. This combination provides an economical long-lasting material for any kind of sheet-metal work.

When you consider the excellent quality, the low cost and the easy workability of Bethlehem Galvanized Sheets, you can see why they are in constant demand by sheet-metal contractors and fabricators.

Bethlehem GALVANIZED Steel Sheets

BETHLEHEM STEEL

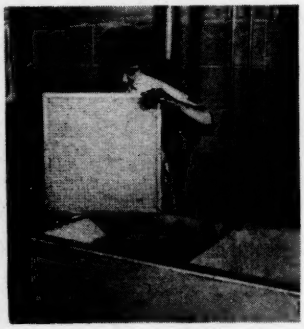
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

(*Concluded from page* 108)

Washable Plastic Air Filter

A washable, plastic air filter for forced warm air furnaces and air conditioning systems, capable of catching pollen from the air and even the most minute solids in cigarette smoke, has been introduced by The Goodyear Tire & Rubber Co., Akron, Ohio. The new filter is a self-charging electrostatic unit which takes useful advantage of the dielectric properties of certain plastic films, resins and waxes.



The material used in the filter is a thin polyethylene film, shredded into a porous mass, which, when exposed in a current of air picks up an electrostatic charge. This charge attracts and retains the finest of dust, soot or smoke particles which may be suspended in the air. It is by nature of its dielectric properties effective throughout its entire thickness.

An economical advantage to this type of filter is that it can be cleaned easily in the home, store or office by rinsing in cold water. No detergent is required, and after rinsing the filter can be drained for several minutes and restored to service while still damp. It may be cleaned over and over again without loss of performance.

More information? Circle Item 41 on postcard, page 111

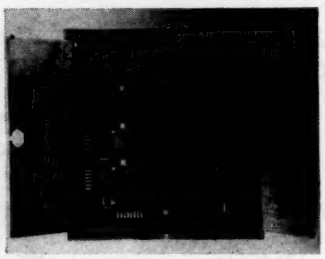
Industrial Maintenance Coating

Neelium, a new high-solids liquid Neoprene solution which can be readily brushed and cured at ordinary temperatures to form a thick resilient protective film, is announced by Atlas Mineral Products Co., Mertztown, Pa. This coating has been designed specifically as an industrial maintenance coating with the object of producing a high quality coating of maximum thickness with a minimum amount of labor.

More information? Circle Item 42 on postcard, page 111

Centralized Safety Control

Centralization of the combustion safeguard equipment for 2 to 16 burners can now be accomplished with the new multiple burner Protect-O-Glo system recently introduced by the Industrial Division, Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.



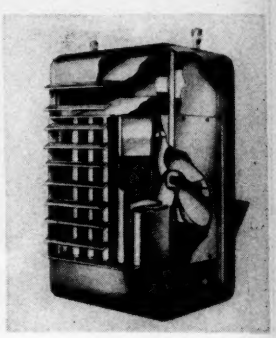
Incorporating the flame rectification combustion safeguard principle, the system features individual flame detecting relays for each burner housed in a single cabinet. These relays are used in conjunction with a photocell flame detector in the case of oil-fired burners or with a flame electrode detector on gas or gas-piloted oil fired installations. The flame detector and relay circuit acts to shut down the fuel supply in the event of flame failure at the burner. The cabinet also houses push-buttons, signal lights and other component parts of the safeguard circuit.

Standard systems handle 2 to 16 burners. There are three operating options available. A sequence light-off, in which the second pilot valve does not open until the first pilot flame has been proved; a unison light-off, in which ignition of all burners takes place simultaneously and an independent light-off, in which each burner is individually ignited.

More information? Circle Item 43 on postcard, page 111

Gas Unit Heaters, 5 Models

A new line of gas-fired heater units in five models, all approved by AGA for natural, mixed, manufactured and propane gases, and having an input range of from 55,000 to 200,000 Btu per hour, is announced by The National Radiator Co., Johnstown, Pa.



Each unit is equipped with automatic controls and packaged in a streamlined, space-saving housing. The cabinet is made of heavy gage steel, with gray baked finish. Burners are of cast iron. An individual burner is provided for each heat exchanger tube. The heat exchangers are made of heavy gage steel welded to steel headers.

To insure maximum heat transfer, steel baffles are placed inside the heat exchanger tubes. There are external baffles to secure turbulence and radiated heat to the air flowing through the heater.

Individually adjustable louvers provide flexibility in directing the flow of heated air within the areas in which the units are hung. The overlapping blade type electric fan, which is a part of the unit, operates on 110-115 volt, single phase, 60 cycle current.

Installation costs are said to be low; the unit merely being hung at the ceiling of the room, the hangers with standard pipe threading being part of the unit. A vent connection is provided.

More information? Circle Item 44 on postcard, page 111

Moisture Absorbent Units

New Hum-i-dri moisture absorbent replacement units are announced by Speco, Inc., Cleveland, Ohio. Packaged in polyethylene outer bags, the new inner replacement bags fit 5 and 10-pound units as well as standard chemical dehumidifiers. According to the manufacturer, the material absorbs up to ten times its weight in moisture, 20% more than ASTM standard flake calcium chloride.

More information? Circle Item 45 on postcard, page 111

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on:

- **News of Equipment and Materials**
- **New Catalogs**

Circle the Item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

CENTRIFUGAL PUMP FILMSTRIPS

Now available through Allis-Chalmers Mfg. Co., Milwaukee, Wis., is the first in a series of a new educational service to industry in the form of three 35mm sound filmstrips on centrifugal pumps for showing before interested groups. Titles of the three films, each with a running time of about 30 minutes, are How and Why of Centrifugal Pumps, Pump Maintenance, and Covering All Angles. The first shows parts and nomenclature, theory of operation, measurement of characteristics, and interpretation of curves. The maintenance film illustrates how to set up a centrifugal pump, starting procedure, lubrication, packing maintenance, mechanical seals, piping tips, and the keeping of operating records. The last describes the selection of a pump and gives information required to figure its installation. . . . . **Item 46**

LOW PRESSURE VALVE CATALOG

A new 8-page catalog on low pressure valves, Catalog LPV-1, is issued by Northern Indiana Brass Co., Elkhart, Ind. It lists 14 different styles of valves for low pressure installations. . . **Item 47**

INDUSTRIAL STEAM TRAPS

Bulletin No. 152, 12 pages, featuring its steam traps equipped with bellows of bronze, monel or stainless steel, and bodies in bronze, semisteel and cast steel construction, in sizes from ¼ to 2 inches for pressures from vacuum to 300 lbs., is issued by W. H. Nicholson & Co., Wilkes-Barre, Pa. Included are recommended piping diagrams, typical applications, tables and data covering the selection of traps for various types of steam-using equipment. . . . . **Item 48**

AIR RELIEF TRAPS

Relief traps are the subject of Bulletin 2062 issued by Armstrong Machine Works, Three Rivers, Mich., and giving descriptive, dimensional and other information on this type of trap intended for venting air from any liquid under pressure. Typical installations include the venting of air from hot water heating systems, water service lines, water storage tanks, and centrifugal pumps. Installation instruction and hook-ups are given. . . . . **Item 49**

SPECIFICATION REFERENCE MANUAL

A new reference manual produced by The Philip Carey Mfg. Co., Cincinnati, Ohio, is in its second printing. It contains a complete listing of 800 building materials and industrial products obtained from asbestos, asphalt or magnesia. It shows Army, Navy, Federal, ASTM and other specifications, plus their corresponding product. Manufacturer indicates that if the products meet, can meet, or do not meet required specifcations. All of this information is cross-indexed to provide efficient reference and is recommendned for anyone with a spec-finding problem. . . . . **Item 50**

COMPANY HISTORY, PERSONNEL

A booklet containing a brief history and biographies of the company's executive personnel has been issued by Brunner Mfg. Co., Utica, N. Y. . . . . **Item 51**

SCHEDULE NUMBERS IN PIPING

An 8-page bulletin 515A, entitled How to Use Schedule Numbers in Power Piping Design by Sabin Crocker, has been issued by Taylor Forge & Pipe Works, Chicago, Ill. The charts, originally prepared by Mr. Crocker in the article of which this bulletin is a reprint, have been amplified to make it more valuable to users. . . . . **Item 52**

COOLING TOWER DATA

Bulletin 401-B on its Flow-Cold cooling towers is available from Acme Industries, Inc., Jackson, Mich. By means of a cut-away model, it illustrates the various parts of the cooling tower; complete specifications are also furnished. The towers are available in six models from three to ten tons. . . . . **Item 53**

ALTITUDE CONTROL VALVES

A 16-page bulletin W-4 fully describing the features of its Cushioned Altitude control valves is available from Golden Anderson Valve Specialty Co., Pittsburgh, Pa. Featured are illustrations, operating sequence and installation arrangements of the various single and double acting altitude control valves. General instructions, parts lists and dimensions are shown, along with a special section on maintenance. . . . **Item 54**

WATER CONDITIONING DATA BOOK

A 102-page data book with flexible cover has been published by The Permutit Co., New York, N. Y., and designed for practising engineers and those who work with water conditioning problems. The book is literally a handbook of all phases of water softening and water conditioning. . . . . **Item 55**

FILM ON SCHOOL PLANNING

A 16mm color sound motion picture on modern school planning entitled Design For Learning, is available from Herman Nelson Division, American Air Filter Co., Inc., Moline, Ill. It is available for architects, consulting engineers, school superintendents and others concerned with school design. Emphasis on the importance of equipment selection for the comfort and convenience of students makes this film story an important one. Prints may be obtained through the company or its branch offices. . . **Item 56**

EXTENDED SURFACE PIPE

Factual, clearly-written, well illustrated and attractively printed, Form 675 a fin-pipe catalog, carefully organized to provide the maximum in information with a minimum of user-reader efforts, is issued by Kritzer Radiant Coils, Inc., Chicago, Ill. In its 8-poges are contained every fact necessary to design, select, and install fin-pipe coils and covers for industrial, commercial and institutional steam or hot water heating. . . . . **Item 57**

CONDENSING UNITS

Catalog C-52 has been issued by Copeland Refrigeration Corp., Sidney, Ohio, and devoted to its line of Copelametic hermetic condensing units made in a wide variety of sizes. Bulletin gives description of the various types of units available and tabulated data. . . . . **Item 58**

LIGHT-RADIANT HEATER FIXTURE

A folder has been issued by Appleman Art Glass Works, Bergenfield, N. J., and describing its Electriglas Thermolite, a combined lighting fixture and electric radiant heater, particularly intended for bathrooms. . . . . **Item 59**

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NON-FERROUS AND BI-METAL SHAPES

A 4-page folder has been issued by Fromson Orban Co., Inc., New York, N. Y., devoted to the non-ferrous and bi-metal shapes which it is prepared to fabricate. These shapes include finned and seamless corrugated tubing, dehydrated copper with sealed ends for refrigeration, stock tubing for shower bars, overflow pipes, etc. . . . . **Item 60**

DUST, FUME CONTROL

Vol. 1, No. 1, of "Dust and Fume Topics," a new periodical published by American Wheelabrator & Equipment Corp., Mishawaka, Ind., is off the press. It is devoted to news of how Dustube cloth tube-type Dust Collectors are handling various dust and fume control problems throughout industry. Future editions will present dust and fume control data and information applying to other segments of the chemical and metallurgical industries. Copies mailed upon request. **Item 61**

HOT WATER RELIEF VALVE

Bulletin 290, 4 pages, has been issued by A. W. Cash Valve Mfg. Corp., Decatur, Ill. and devoted to its type F 51 safety relief valve for hot water boilers, tanks and heaters. This valve is said to have the highest Btu discharge rate of any safety relief valve on the market of comparable size. It has a discharge capacity of 720,900 Btu at a set pressure of 30 lb per square inch gage. Valve is comprehensively described . . . . **Item 62**

INSULATING COATING

A 44-page catalog, GM101, entitled Insul-Mastic in Industry, has been issued by Insul-Mastic Corporation of America, Pittsburgh, Pa., devoted to the company's Insul-Mastic, which can be used as a moisture seal, rust preventive, vapor seal, and insulation. . . . . **Item 63**

CONDENSATION PUMPS

Catalog CP 252 has been issued by Hoffman Specialty Mfg. Corp., Indianapolis, Ind., and devoted to its close coupled condensation heating pumps. Complete engineering data are included. . . **Item 64**

STEAM GENERATORS

Bulletin 533 Revision A, has been issued by Vapor Heating Corp., Chicago, Ill., and devoted to tests on the company's Vapor-Clarkson steam generators. Complete engineering data on these units are included. . . . . **Item 65**

ULTRA-HIGH PRESSURE PUMP

A 6-page illustrated bulletin on general industrial applications of the Kobe high-pressure Triplex pump is issued by Kobe Inc., Div. of Dresser Equipment Co., Huntington Park, Calif. This pump was originally developed to supply power for pumping oil wells hydraulically. Based on its successful employment in that field, the unit attracted attention in other industries where requirements exist for a self-contained, high-pressure hydraulic power source. Shown and discussed in the bulletin are a number of standard applications calling for pressures up to 5,000 psi. Described as well are special applications where pressures up to 20,000 psi are required . . . . . **Item 66**

INDUSTRIAL FAN CATALOG

A revised edition of its catalog DB-4-52 on Bifurcator fans is available from DeBothezat Fans Div., American Machine and Metals, Inc., East Moline, Ill. Designed for exhausting fumes or gases which are abnormally hot, flammable or explosive, this fan is direct motor driven fan in divided housing, with the motor mounted in a separate chamber isolated from destructive gases. Catalog is profusely illustrated and contains specifications, dimensions and certified capacities of fans from 12 through 48 inches handling up to 45,000 cfm. . . . . **Item 67**

GENERAL PURPOSE MOTORS

Construction features, ratings and dimensions of its open drip-proof, Type AP, and splash-proof, Type APWW, squirrel-cage induction motors in ratings of ½ to 100 hp are described in Bulletin 51B-6210D released by Allis Chalmers Mfg. Co., Milwaukee, Wis. . . . . **Item 68**

ALTERNATORS FOR PUMPS, BLOWERS

Bulletin 7110 of Automatic Control Co., St. Paul, Minn., contains factual information on Autocon Multiplex Alternators. Designed automatically to transpose starting sequence of 3, 4, 6 or 12 equally rated units, these alternators can be used with pumps, blowers, compressors, burners or any other units controlled by magnetic starters or two-wire circuits. They will operate from float, pressure, thermal and other pilot switches. They provide an entirely independent circuit for each operating step on every starting sequence. Thus failure of any one unit, relay coil or control switch will not affect operation of the others. . . . . **Item 69**

OIL-BURNING EQUIPMENT

An 8-page booklet on its line of oil fired equipment is issued by Electrol Burner Mfg. Co., Rutherford, N. J. It includes complete specifications and dimensions of the various types of oil burners, water heaters, warm air conditioners, and boilers. . . . . **Item 70**

ELECTRIC BATHROOM HEATER

Form EC-128 is available from Electromode Corp., Rochester, N. Y. describing its automatic electric bathroom heater. The heater, typical installations and suggested uses are shown and the cast-aluminum heating element described. Complete specifications and installation instructions are included. . . . . **Item 71**

PORTABLE AND EXHAUST FANS

Five types of 30 to 48 inch portable fans and twenty models of 27 to 72 inch exhaust fans are illustrated, described, and rated in Bulletin 100 of The Manufacturers Equipment Co., Dayton, Ohio. The fans are applicable to general cooling and ventilating purposes where large volumes of air are to be moved. Direct connected motors range from ¼ to 50 hp; capacities from 6,250 to 140,000 cfm free air. . . . . **Item 72**

PLASTIC TUBING BULLETIN

Reflin, light-weight, corrosion-resistant, thermosetting plastic and Fiberglas-reinforced tubing, is described in a four-page brochure issued by Reflin Co., Culver City, Calif. With a strength-to-weight ratio said to be unequalled by any commercial material, this tubing is said to be ideal for underground conduits, fuel, natural gas, irrigation or sanitary lines, and shipboard piping systems. . . . . **Item 73**

PREFABRICATED PIPE AND TUBE

A six-page, three-color folder showing numerous uses of its product is available from the Sawhill Mfg. Co., Sharon, Pa. Two pages show various shapes and forms of pre-fabricated pipe and tubing. Inside spread depicts twenty-two ways tubing is applied to different equipment and products. . . . . **Item 74**

EXPANSION JOINTS FOR PIPE

A new technical bulletin 35-51A, on Corruflex packless expansion joints has been published by American District Steam Co., Inc., North Tonawanda, N. Y. It contains 28 pages with information on selection, specifications, and installation. Tables give weights and dimensions for single and double self-equalizing joints and for non-equalizing joints. Sizes for all three types range from 3 to 54 inches. Dimension drawings accompany the tables. A feature is a group of 29 drawings showing variations from the basic expansion joint. These drawings will be useful in solving numerous pipe expansion problems . . . . . **Item 75**

HOW STEEL PIPE IS MADE

The story of how Wheeling Steel Corp., Wheeling, W. Va., produces steel pipe on the world's fastest continuous weld pipe mill at its Benwood Works is graphically told in a new booklet. It was at Benwood Works in 1888, that the first steel pipe was made. The picture story unfolded in the Continuous Weld Pipe book shows how engineering has improved the technique of making steel pipe from that first crude process to present day 1,000-feet-per-minute production speed, with the help of highly automatic equipment and advanced metallurgical methods. The book follows the pipe-making process from molten iron through ingot soaking, blooming mill, billet reheating, skelp mill, giant continuous weld mill, flying hot saw, cooling racks, hydrostatic pressure test, and galvanizing, to warehousing and shipping. Center spread of the book is a simplified flow chart of the entire process. . **Item 76**

AIR TRAP SELECTION

Bulletin 2021 on selection and installation of air traps has been issued by Armstrong Machine Works, Three Rivers, Mich. These traps are for the automatic drainage of water from compressed air intercoolers, aftercoolers, receivers, separators and drip points. The bulletin gives an easily understood guide to the proper selection of the different types of traps. . . . . **Item 77**

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77			

July H/52

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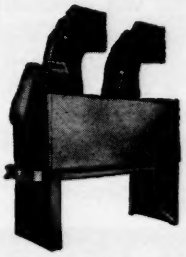

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McQuay Horizontal Unit Heaters are made in a wide range of capacities, from 20,300 to 360,000 Btu per hour. Every unit has the exclusive Ripple Fin Coil construction . . . with these advantages: more heat transfer surface, greater flexible strength, cleaner operation... flexible copper tube headers to accommodate unequal expansion and contraction. Tubes expanded into fins having wide, smooth collars, without use of any low conductivity bonding agents, provide a permanent mechanical bond.

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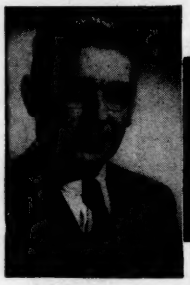


Experience is my Classroom

By T. W. REYNOLDS

• UNDERFLOOR HOT AIR HANGAR HEATING

A consulting engineer with considerable experience in designing heating systems for airplane hangars has commented on my article Heating Airplane Hangars in the January issue. In connection with floor radiant heating with warm air, his comment is that the heavy wheel loads of the planes reaching 70,000 lb per axle on a dual wheel, make the hangar floor slabs important structural members. He comments that the use of large duct areas under these slabs would result in major increases in the structural requirements and cost of the floor slab and as a consequence it may be expected that the minimum slab thickness of 10 to 12 inches in floors without ducts would increase with the introduction of the ducts, consequently causing an excessive heat lag, as well as an unwarranted increase in overall cost of the structure.

In reply I would say that the point is well taken for large ducts indiscriminately routed which may require heavy floor slabs, but large ducts, because of size, become few in number and need only local reinforcement, if any. Experience derived from many installations has proven that large ducts can be properly run to avoid structural difficulties. However, the use of large ducts was not proposed. The article referred to specifically describes the use of small multiple ducts which also have been used in hangars without difficulty.

• CUMULATIVE EFFECT OF BOILER OVERSIZE

I never heard of a purchaser who needed a 5-ton truck but bought a 10-ton truck. However, with boilers it is often thought wise to be safe and therefore increase the capacity. Each item entering into the total load is usually considered as if it were the sole item, so that the grand total of all items (concurrent or otherwise) is sometimes amazing. Radiation in the finished attic room or rooms seldom used at below freezing outdoor temperatures will be added in as connected peak load. The pick-up load is next included and being a matter limited by judgment, it is made liberal, even though it might be but little due to a mild climate, the particular piping system, or the possibility of waiting a little longer for heat in the few days of really cold weather.

A big boiler means a big stack drawing a lot of air out of the living quarters in off as well as on periods, or if the air is removed only from the basement, the floor above will be colder. Connected piping becomes larger and contains more air to vent, although this is nothing compared to the air contained in the steam space of the bigger boiler.

A big boiler means more in the following: Water to heat, flue surface to soot up and to clean, water treatment, space required, foundation, weight, radiation losses, possible overheating of basement, cost for labor, installation, parts and repair, and ultimate replacement cost. More boiler sections provide more sections that could break, and increase the difficulty of installation. In some cases, bigger boilers have outlets increased in number and size and also a higher water line which may require a pit with waterproofing. There may also be more carry over of moisture.

The bigger the boiler, the larger must be the burner and controls; or if the burner is kept the same size, the bigger the oil burner nozzle to waste fuel and to make more combustion noise. If the greater amount of heating surface and the larger smoke pipe and chimney cool off the boiler too much, then the heating surfaces soot up and efficiency falls off. Should the chimney, however, not be large or high enough, then the added heating surfaces will reduce the draft because of the additional restrictions and in some cases because of low flue gas temperatures.

A warm air furnace is not a boiler, but it too can be made so big that the connected warm air pipes cannot carry away the heat. This will eventually burn out the furnace. Make the burner big and it will also make things hotter, because the warm air pipes are relatively slow movers. Furthermore, this condition will be so frequent because a big burner will only be on for a brief period. Expansion will be amazing and safety controls will shut off the burner prematurely.

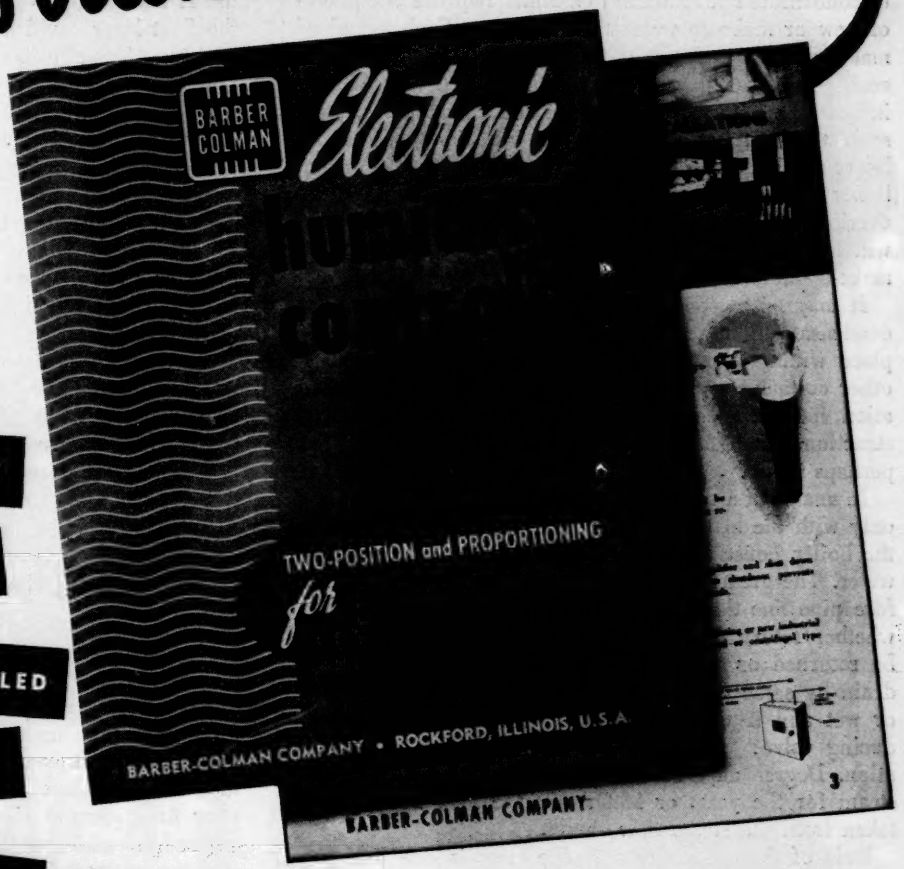
• ECONOMICS OF RETURNING CONDENSATE

With very few exceptions, it always pays to return condensate to the boilers and not to waste it down the drain. Sometimes it does not pay where the amount returned is small and the length of new return line required is over-long. Usually, however, the first cost and the operating and maintenance costs of a new pump are relatively small. Even where the condensate is contaminated it can often be used in a suitable heat exchanger.

These remarks are occasioned due to an inquiry about such a problem, where as usual, the inquirer overlooks many pertinent factors, as well as the indirect savings involved. He writes that he has an 8-inch steam pipe line run 2,300 ft underground from the boiler house to a group of buildings, pressure at boilers 145 lbs gage (no superheat) is reduced to 105 lbs gage. About 300,000 lb steam is supplied on the average for each 24 hours on wintry days, and 8.4 lb water are evaporated per pound of 11,000 Btu coal costing $4.50 per ton as delivered in the bunkers. No condensate is now returned as the 4-inch return is in such condition that it is abandoned. He wants to know how much is now going down the drain and what

(*Continued on page* 114)

here's valuable data....



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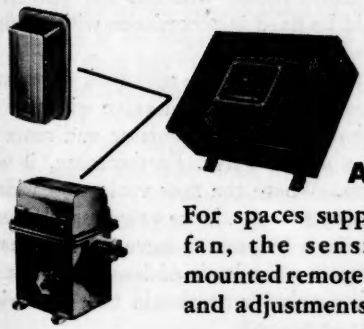
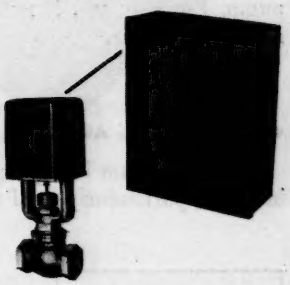


REMOTE ELEMENT APPLICATIONS

For spaces supplied by a central fan, the sensing element is mounted remote from the amplifier and adjustments.

ASPIRATING CONTROL

For use in those areas not completely air conditioned, the sensing element is mounted in a fan-fed sampling chamber.



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(*Continued from page* 112)

should be the size of the new return. He says nothing about the extent of return line branch connections.

The mathematics involved would not be of interest, due to the many assumptions which would have to be made. However, the indirect items to be considered and often overlooked are well worth pointing out. Each pound of condensate not returned to a boiler requires one pound of new or make-up water to the boilers. Each pound of make-up water increases the cost of water treatment. Each such pound introduces more air into the boilers. All this increases the corrosion of boiler tubes and pipes, adds scale to the tubes with resulting inefficiency while the lower temperature of the water increases stresses on the boiler tubes and causes the boiler to be operated at an overloaded or inefficient point. More frequent blow down will be required and this also increases the amount of make-up water.

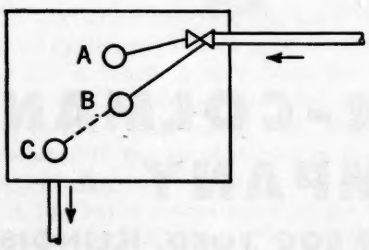
It may be reasoned that the savings by returning the condensate should pay for the cost of the new return in place within 5 years. There is, however a number of other costs involved, such as cost of pumping, depreciation, interest on investment and supervision of new construction. Maintenance within the five-year period will perhaps be nil.

In analizing a problem of this nature, one is concerned only with the heat contained in the condensate entering the boiler house less the heat contained in the make-up water. The greater amount of heat in the condensate before pipe line thermal losses is of no moment. It is lost whether returned or wasted. Will all of the condensate be returned or will some necessarily be wasted to the drain by some process? Is the steam as evaporated dry or wet and if wet, dried by superheat through the reducing valve? Wetness affects the total heat of evaporation. Degree days should enter onto the total flow of steam for the year, or better still the total flow can be taken from the steam flow charts.

Rule of thumb for return pipe sizes is one half the diameter of the steam pipe, but only provided the steam pipe is not overloaded. The return pipe size can of course be more accurately sized by considering whether it is dry, wet, or vacuum. In any event, the pressure required to enter the boilers and overcome the resistance of the return line has to be determined. The return should be liberally sized to reduce the first and other costs of the pump. Furthermore, it must be sized on maximum and not average flow.

• WHEN TANKS ARE TOO LARGE

Whenever I am in a plant I like to look over the tanks installed, particularly so if the tanks are operated by ball float control. Usually, such tanks are in a hot, dirty or rather elevated position where they are soon forgotten and their proper operation neglected.



A tank not fully utilized.

Consider, for example, a tank as illustrated. Whenever there is a maximum withdrawal of water from this tank, the float lowers from *A* to *B* so that input will equal output at that float position. For such an adjustment, of what use is that portion of the tank below float *B*? Of course, the float lever could be lengthened to assume the dotted position *C* and utilize practically the full height of the tank's content, but of what purpose is this if the greatest withdrawal can be met by position *B*.

Many a dollar is thrown away for tanks that are larger than needed. The larger the tank, the more there is of piping, insulation, maintenance and labor for installation. The larger the tank, the more the metal and contained water weighs and the greater the cost of supports. Altogether a lot of space is taken up for the usual tank and its supports, hence the need for keeping a tank size down to requirements.

There are various other forms of tank control which, although more complicated, may in some cases be more economical because of better control and because such control will allow a reduction of tank size when the tank is designed. The more complex controls are better suited to meet the peaks and valleys of input and output.

• SIZING THE REDUCING VALVE

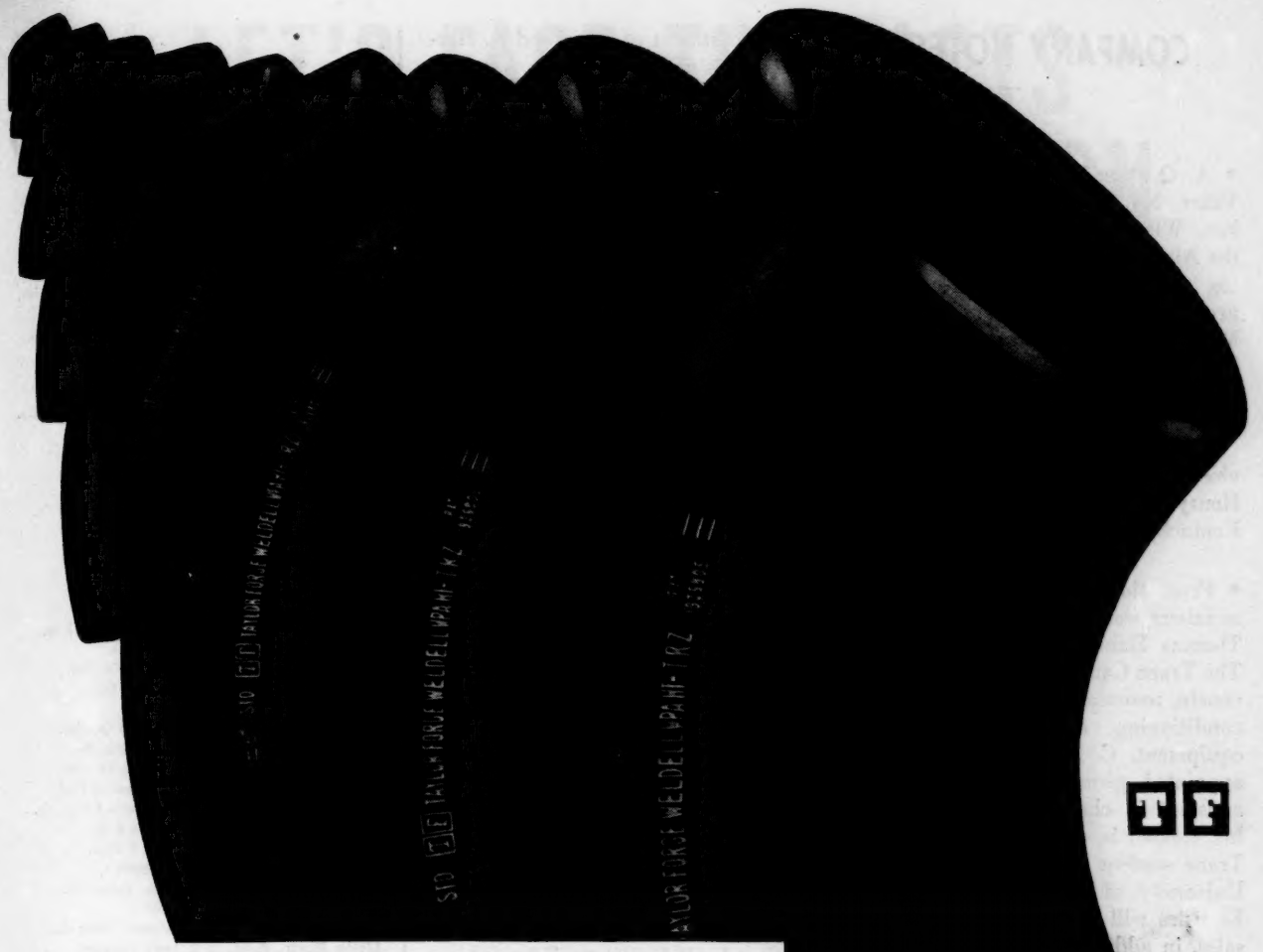
Some things are made too large with no resulting harm except needless money in first cost expenditure. Harm may follow in other cases.

Both steam traps and pressure reducing valve are more often over than under size. Size a reducing valve, then after thinking it over carefully, reduce the size. Now call in a sales engineer of this specialty and he will reduce your final selected size so much that, as a check, you proceed to call in another sales engineer. If you do, I feel sure the last party is more apt to decrease the size than to increase it.

By psychology or mistaken conception there is a tendency to make the size of a trap or reducing valve the same as that of the connected pipe line. However, the pipe size is properly determined by the allowable pressure drop and other considerations, whereas the size of a reducing valve should be fixed in accordance with the flow of steam it is supposed to control.

A 2-inch valve in a 4-inch pipe line may look funny and call for pipe reducers, but such a sized valve will have so much more of lift that it will not wiredraw and score to the same extent as a 4-inch valve. Furthermore, it will give better regulation. Where the flow varies too widely and must be closely controlled, a large valve may be used with a smaller valve in a by-pass. I have seen ordinary stop valves sized large on the basis of less resistance to steam flow, but such a valve is or should be either wide open or closed tight.

Another mistaken concept is to use a small pipe size before and sometimes after a reducing valve, thus obtaining part of the pressure drop by ordinary means. This idea overlooks the fact that pressure drop varies with the rate of flow and may make regulation difficult, and that high velocities may erode pipes and bends, cause water hammer and too much noise.



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COMPANY NOTES

• A. O. Vogel, vice president, The Vilter Manufacturing Co., Milwaukee, Wis., was elected president of the Air Conditioning and Refrigerating Machinery Association at the group's meeting in Hot Springs, Va., May 23. Other officers elected were M. M. Lawler of Worthington Corp., Harrison, New Jersey, first vice president; A. J. DeFino, Fedders-Quigan Corp., Buffalo, New York, second vice president; and G. A. Heuser, Henry Vogt Machine Co., Louisville, Kentucky, treasurer.

• Promotion of two sales department members was recently announced by Thomas Hancock, vice president of The Trane Company, La Crosse, Wisconsin, manufacturers of heating, air conditioning and heat exchange equipment. C. R. Conner has been appointed general sales department assistant in charge of jobber sales. Mr. Conner is a 1946 graduate of the Trane student training class and the University of North Dakota. R. S. Knowles will handle gas unit heater sales, in addition to his regular duty as manager of hot water specialties sales.

• Aldip, a new dipping process for coating steel and other ferrous metals with aluminum, has been disclosed by the General Motors Research Laboratories. Importance of the new process is twofold: (1) As a corrosion or rust resistant coating; (2) when diffused by heat treatment, Aldip becomes a heat resistant material. Alfred Boegehold, assisted by Clarence J. Tobin, Dean K. Hanink and Howard L. Grange, developed the new technique over a six-year period.

• The appointment of John K. Farrar as sales manager of the Mor-Sun Furnace Division of Morrison Steel Products, Inc., Buffalo, has been announced. Mr. Farrar's appointment is a promotion from the position of acting sales manager, which position he has held since February 12. Previous to this, Mr. Farrar was assistant sales manager; he joined the organization as a manufacturer's sales representative in 1950.

• Appointment of Raymond R. Harnetiaux as manager, Warm Air Furnace Division, has been announced by United States Radiator Corp. Mr. Harnetiaux joined U. S. Radiator on his return from an extended period of service in Korea, where he served as a Major in the Engineer Corps. Prior to that time, he was sales manager of all heating products for Fairbanks, Morse and Co.

• The appointment of Paul Ozanne as manager of the sales and economic analysis division of Minneapolis-Honeywell's marketing research department has been announced. Following graduate work at Wisconsin, where he received the Wisconsin Alumni Research Foundation Fellowship, Mr. Ozanne was employed for four years by Swift & Co., meat packers. From 1946 to 1950 he was head of the mathematical statistics department of Industrial Survey Co., a Chicago market research firm. He has been chief statistician in the comptroller's office of the U. S. Army at Camp Cooke, Calif. since 1950.

• Kewanee Boiler Corp. and Ross Heater & Manufacturing Co., Inc., two divisions of American Radiator & Standard Sanitary Corp., have combined to form a new company, Kewanee-Ross Corp., effective June 30th. Both units of Kewanee-Ross Corp. will continue to operate as before, maintaining their respective plant locations, sales offices and representatives. However, the unification of the management, personnel and facilities of the two firms will provide a substantially wider range of related products and services. For example, in addition to manufacturing a complete line of boilers and allied equipment, Kewanee's heavier facilities and larger plant area will be utilized to produce heat exchangers and surface condensers of considerably greater size than had been economically feasible in the Ross plant. In turn, Ross facilities will be freed for producing increased quantities of smaller heat exchanger units. Charles H. Currier, formerly president of Ross Heater & Manufacturing Co., Inc., has been named chairman of the board of directors of Kewanee-Ross Corp. W. Bradford Russell, formerly president of Kewanee Boiler Corp., is president of the new firm.

Deal with people you know at *Pur Air*

SALES OFFICES

Albany, New York, F. R. Foote Co., Inc.
Albuquerque, N. M., Boyd Engineering Co., Inc.
Amarillo, Texas, Snook & Aderton, Inc.
Atlanta, Georgia, Crawley-Gorbant Co.
Baltimore, Md., Lancaster, May & Co.
Billings, Mont., Sullivan Valve & Engr. Co.
Binghamton, N. Y., Dudley W. Gregg
Birmingham, Ala., S. C. Bratton Sales Engr. Ltd.
Boston, Mass., L. R. Geissenhainer
Bridgeport, Conn., Augur, Jones & Green
Buffalo, N. Y., Van Ness Harwood Co.
Butte, Mont., Sullivan Valve & Engr. Co.
Charleston, W. Va., Engineering Products Co.
Charlotte, N. C., Robert E. Mason & Co.
Chicago, Ill., Zintel, Byfield & Co.
Cincinnati, Ohio, Russell R. Gannon Co.
Cleveland, Ohio, Dan B. Billington
Columbus, Ohio, Russell R. Gannon Co.
Corpus Christi, Texas, L. S. Pawkett & Co.
Dallas, Texas, W. E. Lewis and Co.
Davenport, Iowa, D. C. Murphy Co., Inc.
Dayton, Ohio, Russell R. Gannon Co.
Denver, Colorado, E. P. Murr
Des Moines, Iowa, D. C. Murphy Co., Inc.
Detroit, Mich., George Q. McNamara, Inc.
El Paso, Texas, Boyd Engineering Co., Inc.
Fort Wayne, Ind., Jones Engineering Prod.
Great Falls, Mont., Sullivan Valve & Engr. Co.
Hammond, Ind., Zintel, Byfield & Co.
Hartford, Conn., Augur, Jones & Green
Houston, Tex., Jack Thomas Davis
Indianapolis, Ind., Russell R. Gannon Co.
Jackson, Miss., Robert Porter
Kansas City, Mo., Manufacturers' Sales Co.
Little Rock, Ark., J. C. Lewis Company
Los Angeles, Cal., Hess, Greiner & Polland
Louisville, Ky., Russell R. Gannon Co.
Lubbock, Tex., Snook & Aderton, Inc.
Memphis, Tenn., J. B. Lammons
Miami, Florida, Stuart G. Pizie
Milwaukee, Wis., Zintel, Byfield & Co.
Nashville, Tenn., S. C. Bratton Sales Engr. Ltd.
Newark, N. J., John B. Hewett Co., Inc.
New Orleans, La., Robert Porter
New York, N. Y., John B. Hewett Co., Inc.
Norfolk, Va., Laurence Trant & Co.
Oklahoma City, Okla., J. M. O'Connor Co.
Omaha, Nebraska, D. E. McCulley
Peoria, Ill., Zintel, Byfield & Co.
Philadelphia, Pa., George F. Bertrand Co.
Phoenix, Ariz., Boyd Engineering Co., Inc.
Pittsburgh, Pa., E. J. Deckman Co.
Portland, Maine, A. E. Wallgren
Portland, Ore., T. C. Langdon Co.
Rochester, N. Y., A. R. Bowman Co.
Rockford, Ill., Zintel, Byfield & Co.
St. Louis, Mo., Myers Engr. Equipment Co.
St. Paul, Minn., Thermal Co., Inc.
Salt Lake City, Utah, Williams, Gritton & Wilde
San Antonio, Tex., L. S. Pawkett & Co.
San Francisco, Cal., E. C. Cooley Co.
Seattle, Wash., E. H. Langdon Co.
Spokane, Wash., Sullivan Valve & Engr. Co.
Toledo, Ohio, Eyster Engineering Co.
Tulsa, Okla., J. M. O'Connor Co.
Washington, D. C., Lancaster, May & Co.
Wichita, Kansas, J. M. O'Connor Co.

Pur Air

LET'S FACE THE FACTS ABOUT ACTIVATED CARBON FOR ODOR REMOVAL

In government and private laboratories it has been fully established that activated carbon will remove odors by adsorption. So practical buying boils down to type, quality and amount of carbon to do a job properly.

THESE ARE THE VITAL CONSIDERATIONS

1. Carefully-controlled, gas-adsorption tests prove without question that carbon made from coconut shells has the greatest adsorptive power ... far above coal carbon and other wood carbons found in some installations. Actually in our laboratories we have tested more than 15,000 different carbons. Activated, coconut-shell carbon stood out. Otherwise, why bring coconut shells from half-'way around the world?

2. Activated, coconut-shell carbon comes in various degrees of activation. A full, 50-minute carbon is most efficient. That is a coconut-shell carbon, a small quantity of which holds up under severe testing with a highly potent gas for a grueling 50 minutes... the equivalent of many, many months of ordinary, odor-removal service. ACSC* is such a carbon.

3. Finally, the amount of carbon is vitally important, for the carbon alone does the job of removing odors. So, in comparing similar equipment, check to see which has the most carbon with the least air resistance.

To sum up, be sure you are buying *50-minute* ACSC* in sufficient amounts to do your odor-removal job.

Pur Air is the *only* manufacturer that both produces Activated, Coconut-Shell Carbon and builds the containing-equipment, too. That makes for real quality-control.

And 32 years of producing gas-adsorbent carbons provide the "know-how". If you have an odor problem, call on us.

*ACSC — activated, coconut-shell carbon.

Pur Air

a division of **AMERICAN SOLVENT RECOVERY CORP.**

COLUMBUS 3, OHIO

WORLD'S LARGEST **PRODUCER OF GAS-ADSORBENT CARBONS**

NEWS OF THE MONTH

AUTOMATIC COAL BURNER

developed for house heating performs well in field trial.

The Bituminous Coal Research downflow stoker boiler, a completely automatic home heating unit requiring practically no attention by the householder, has been developed at Battelle Memorial Institute in cooperation with Bituminous Coal Research Inc. It is now undergoing field trial.

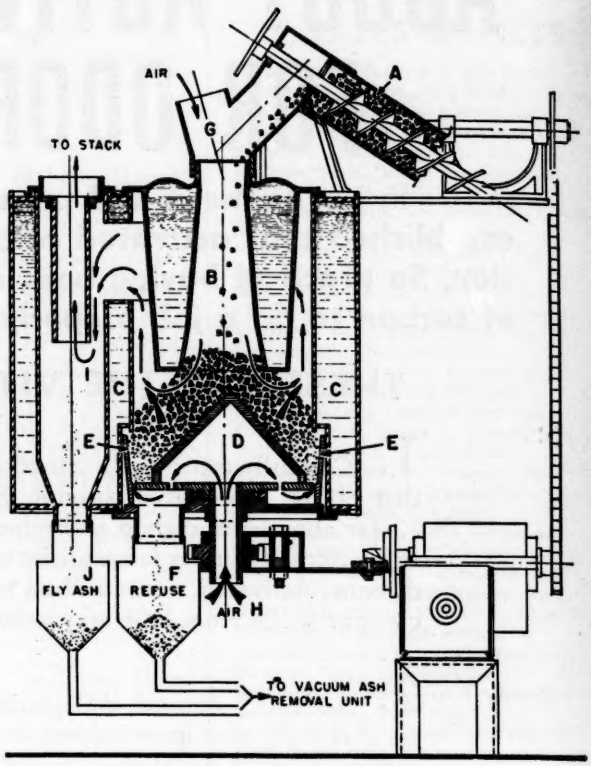
Development of the unit was initiated in response to demand of the coal industry for an attention-free heating device for residences. Although it was realized that such a device would have a higher initial cost than conventional coal burning equipment, the industry believes that it can be made competitive in combined first and operating costs with other automatic heating devices.

• **UNIT.**—A field trial installation has been operating continuously since February 19 at a private residence in Columbus, Ohio. The installation consists of a coal bin, coal feed tube, the downflow stoker boiler, and a sealed ash container which may be located either indoors or outdoors. The unit has operated satisfactorily since its installation. Because it maintains a small fuel bed during hold-fire, the unit is more responsive to heat demand and less subject to overruns than the conventional stoker-fired boiler. The home-owner also reports that the need for ash removal from the basement only once a week or ten days and the elimination of dust are pronounced improvements over the conventional stoker-fired equipment formerly used.

• **OPERATION.**—Either caking or non-caking coals of either high or low ash-softening temperature can be burned in the unit. Stoker coal is fed from a bin to the top of the unit by means of an upwardly inclined feed screw and tube (A in the accompanying sketch). Coal from the feed tube trickles to the top of the fuel bed in combustion chamber (B). The products of combustion pass upward between the water-cooled walls of the inner cast iron and the outer steel heat exchanger to the flue (I). In making a 180-degree turn at the flue entry, fly ash is centrifugally dropped and deposited in container (J).

The fuel bed is supported by a conical grate (D) which, by means of mechanical linkage, is rotated slowly in conjunction with the coal feed screw. Ashes sift through the fuel bed to the periphery of the grate and drop into the space beneath the grate from which they are swept into the refuse container (F). Because the conical grate is eccentrically mounted, all clinkers and large pieces of refuse are crushed between the grate and ribbed crushing wall (E).

Air for combustion enters through the opening (G) at the top of the combustion chamber and the opening (H) formed by the hollow grate shaft. The air entering at (G) passes down through the fuel bed and up between heat exchange surfaces. The air entering at (H) flows upward around the periphery of the grate, then through the fuel bed, and on to the flue.



BCR automatic boiler.

• **ASHES.**—The ashes, which collect in containers (J) and (F), are removed automatically by the vacuum ash-removal system to two one-bushel baskets in the sealed ash-containing housing. The emptying of these containers once every seven to ten days is the only attention the Downflow unit requires and since the containers will be located outside the house they could be emptied by the trash collector without disturbing the householder.

Information on design and performance is being supplied to stoker manufacturers.

CONSTRUCTION ACTIVITY

revealed by NPA lists of second quarter, 1952, commercial construction approvals.

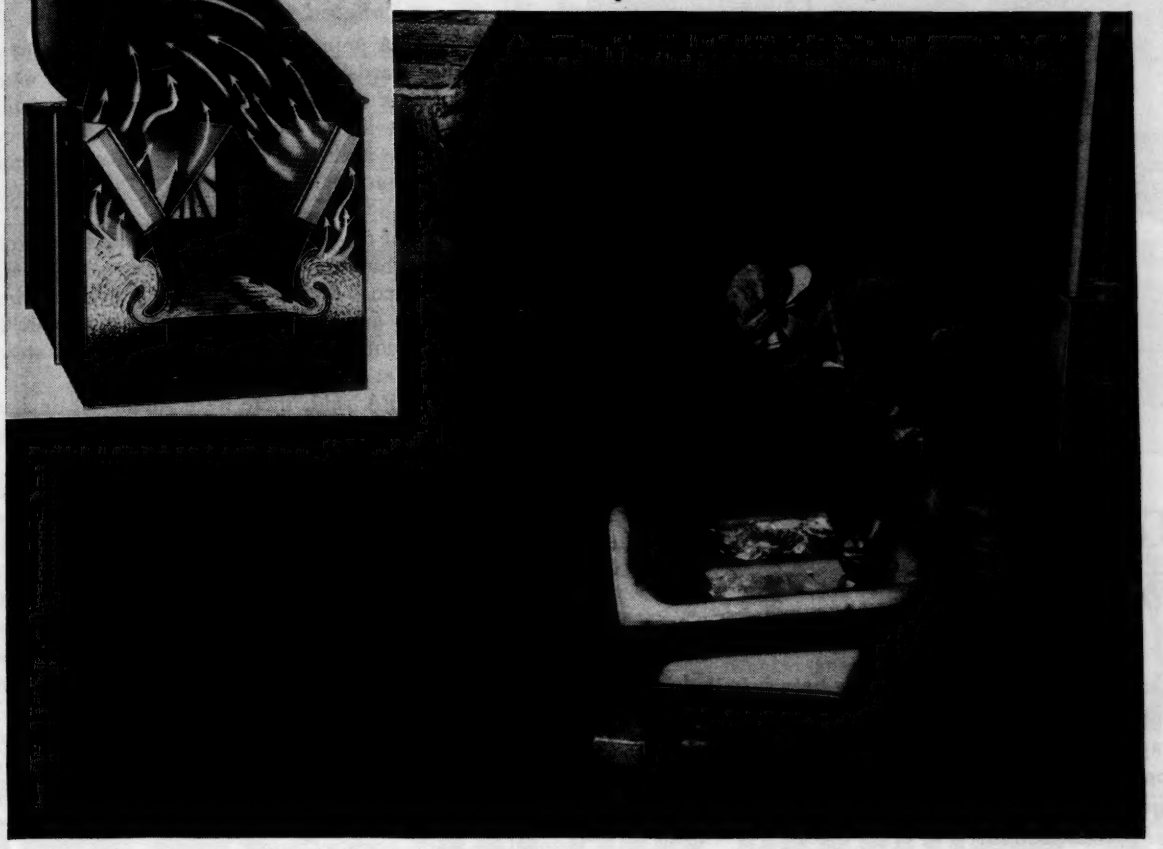
Approval of 1,599 commercial construction projects throughout the United States, with an estimated cost of over $726 million, was announced April 17 by the National Production Authority, Department of Commerce. The approvals, made on second quarter applications, carried allotments of materials for that or succeeding quarters.

• **BREAKDOWN.**—A geographical breakdown on the construction showed California leading the country with 254 projects costing more than $146 million, New York was second with 156 projects costing more than $118 million.

(*Continued on page* 120)

today's best buy is better air!

Inset: Cross section of Type N ROTO-CLONE Hydro-static precipitator with double impeller.



Type N ROTO-CLONE exhausts fine dust from portable grinding operation at the American-Standard plant in Louisville.

ROTO-CLONE collects fine grinding dust ...improves worker efficiency

Fine dust from portable or flexible shaft grinding can seriously affect production. If uncontrolled, the fine particles produced by these operations remain suspended over long periods, and in many instances create a visible fog of floating dust. Such a condition reduces both operator efficiency and unit production.

American Radiator and Standard Sanitary Corporation eliminates this dust problem from their workrooms with AAF Type N *ROTO-CLONES. These versatile *hydro-static precipitators* efficiently exhaust, separate and store dust in one compact unit. The exclusive design of the Type N ROTO-CLONE also provides uniform air delivery and assures sufficient air flow at hoods and unvarying velocities in ducts and branch pipes at all times.

Here's another big plus! The ROTO-CLONE's high efficiency allows recirculation of cleaned air back to working areas, thereby saving heat loss.

To improve efficiency on grinding, buffing or similar operations investigate the complete line of ROTO-CLONE dust collectors. Call your nearby AAF representative or write direct to us for Engineering Bulletin No. 277-A.

**ROTO-CLONE is the trademark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

American Air Filter
COMPANY, INC.
294 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, Cal.

AAF

Tons of "K" Fittings *for hospital building*

Many of the fittings have already been installed. Many more are stored in other bins. The photograph shows only a few of the tons of "K" cast-iron fittings delivered by a distributor to the plumbing contractor for a hospital building under construction.

If you examine a "K" fitting, you'll see that it's an excellent piece of work. The walls are smooth inside and out. The threads are sharp and clean; the entrances chamfered. The angularity of each fitting is correct. In the case of a "K" flanged fitting, the faces are accurately milled; the bolt holes exactly spaced.

"K" fittings are structurally uniform, close-grained, and free of defects. In tensile strength they far exceed the standard requirement.

Order fittings from distributors who handle the Kuhns line bearing the "K" trade-mark.

CAST-IRON FITTINGS
3000 SHAPES AND SIZES

THE KUHNS BROTHERS COMPANY
Dayton 1, Ohio
Established 1887

CONSTRUCTION ACTIVITY

(*Continued from page* 118)

Each area, NPA pointed out, is included in the list of seven so-called hardship areas in the country to which NPA has given special consideration for the alleviation of unemployment in the building trades brought about by lack of defense industrial expansion construction and the slack in ordinary construction due to NPA construction regulations.

A breakdown of the approvals by 45 categories of construction shows churches lead the list with 638 projects at an estimated cost of more than $142 million. Next largest categories are office and loft buildings with 84 projects costing more than $133 million, and retail stores with 161 projects at a cost of plus $78 million.

In addition, NPA said, there were some 350 applications with an estimated cost of $160 million which had to be deferred for later action.

NPA already has announced several groups of individual listings of second quarter projects. Today's announcement included two more lists. The first consists of 551 projects with an estimated cost of $306,850,784, in the 13 regions in the country, which either were given allotments of materials, approvals with no allotment required, or which were exempt from the necessity of NPA approval under self-authorization procedures of NPA construction regulations.

The second list of 312 projects with an estimated cost of $104,535,936, consists of three special categories of construction: 1) municipal and religious; 2) hardship cases, which arose from fire loss, demolition or condemnation, and 3) critical unemployment area construction. The last list is a supplemental one of 166 additional projects in the first six hardship areas at a cost of $71,708,936.

The two lists of individual projects are available for inspection at the NPA Office of Public Information in Washington and at Department of Commerce field offices.

HYDROGENATION

of coal on commercial scale for chemicals starts in huge continuous pilot system of private industry.

Coal hydrogenation became an established industrial operation, expected to result in a vast outpouring of new and useful chemical products, with the surprise unveiling of a huge new pilot plant operation at Institute, W. Va., by Carbide & Carbon Chemicals Co., a subsidiary of Union Carbide & Carbon Corp. The announcement, May 7, marked the completion of six weeks of continuous operation for the king-sized unit which is actually processing coal at the rate of 300 tons a day.

A major chemical company has thus completed the critical phases of a much publicized process utilized in somewhat different form in Germany to make gasoline, and originally expected to be first applied here also for making liquid fuels. The United States government has spent scores of millions of dollars on pilot plant installations aimed at

(*Continued on page* 122)

BUY The DIFFERENCE
. . . at No Extra Cost

Only Airsan offers you ALL these filtering features—

- *galvanized steel frames*
- *bronze welded corners*
- *drain slots for quick, easy cleaning*
- *expanded metal face plates act as lint arrestors*

Airsan Air Filters are viscous type, permanent and cleanable. Write for free bulletins.

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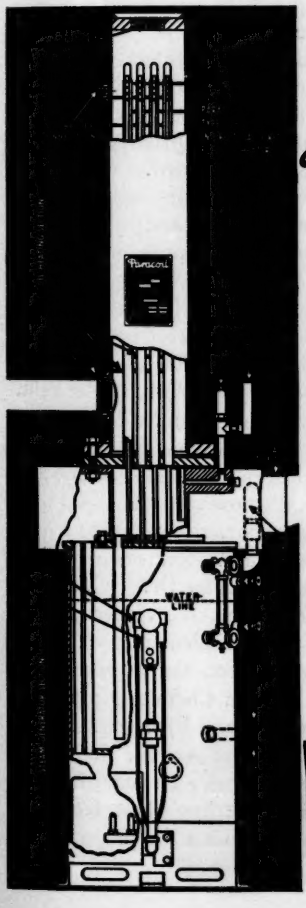
A Few Distributorships Available. Write for Details.

"AIRSAN" is Reg. U. S. Pat. Off.



A GREAT NEW DEVELOPMENT IN OIL PREHEATER DESIGN

Paracoil Keeps Pace With The Rapidly Changing Needs Of The Oil Burner Industry

The TYPE "GF" INDIRECT GAS FIRED FUEL OIL HEATER

A RADICALLY NEW APPROACH TO THE PROBLEM OF ADEQUATE OIL PREHEATING UNDER ALL OPERATING CONDITIONS!

The Type "GF" Oil Heater is an integrated self-contained steam vapor generating exchanger using gas as its primary heat source.

However, the gas flame does not come in contact with the tubes containing the fuel oil. Instead, vapor from the lower steam generating section does the actual oil heating!

APPLICABLE TO ALL TYPES OF OIL FIRED APPARATUS!

As it is not dependent upon the unit it is servicing for the means of heating the oil, the Type "GF" Heater can be applied to any oil fired apparatus, be it a steam or hot water boiler, a process oven, a dryer or a kiln!

A COMPLETE SOLUTION TO THE OIL-IN-BOILER PROBLEM!

As the Type "GF" Heater is in no way connected to the steam or water space of any boiler it may be serving, there can be no possible contamination of the boiler heating surfaces in the event of an oil leak in the heater.

CHECK THESE FEATURES!

Completely factory assembled • Easy to install anywhere, even outdoors • Requires only minimum of floor space • Economical to operate • Wide range of oil heating capacities • Burns any specified type of gas fuel High oil temperatures at all times • Operation unaffected by normal variation in viscosities of oils being heated • Reduces oil consumption through improved fuel combustion.

THE PERFECT HEATER FOR:

- Low temperature forced hot water heating systems on No. 6 oil.
- Plants with starting difficulties after week end shutdowns.
- Supplementing inadequacies in present oil preheating systems.

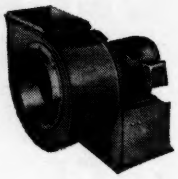
Approved by Board of Standards and Appeals, City of New York—Cal. No. 362-51SA

BULLETIN 60-L
WRITE FOR YOUR COPY TODAY!

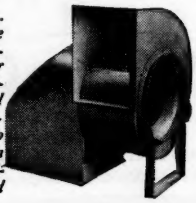
DAVIS ENGINEERING
CORPORATION
30 ROCKEFELLER PLAZA, NEW YORK 20, NEW YORK • 1064 EAST GRAND STREET, ELIZABETH 4, NEW JERSEY

A fan for every need from HERMAN NELSON

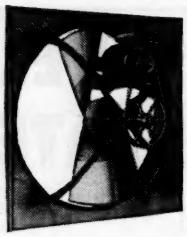
Direct Drive Unit Blowers *are available in 12 models. Wheel sizes from 4" to 11". Choice of speeds available in each size. These units may be mounted on floor, wall or ceiling.*



Belt Drive Unit Blowers. *Available with either the quiet, slow speed, forwardly curved blade wheel or the efficient, non-overloading, backwardly inclined blade wheel. Wheel diameters to 30". Capacities up to 18,300 cfm. All Herman Nelson Unit Blowers available for any discharge and rotation.*



Belt Drive Propeller Fans *These versatile units deliver maximum amount of air effectively . . . quietly. Operate horizontally or vertically. Wheel diameters from 24" to 54". Capacities up to 36,000 cfm.*



Direct Drive Propeller Fans. *Both small sizes for use in offices, laboratories, etc., and also heavy duty units commonly used where contaminated air cannot penetrate the totally enclosed motor. Sizes from 14" to 36". Capacities up to 14,600 cfm.*

Write for detailed information about any type Herman Nelson Fan to Dept. HV-7

AAF herman nelson moline illinois

HERMAN NELSON

Division of **AMERICAN AIR FILTER COMPANY, INC.**
MOLINE, ILLINOIS

HYDROGENATION

(*Continued from page* 120)

achieving a continuous and economical method of hydrogenating coal to make gasoline, and several major oil companies have carried similar projects to various stages of completion.

• **DIFFERENT.**—Union Carbide, through its chief industrial chemicals subsidiary, has gone at the task, however, with an entirely different economic concept in mind—that hydrogenation can be made most useful and economical as a source of chemical products.

Its achievement of a workable process in face of huge engineering hurdles, evidenced by early breakdowns in equipment operated by the government, is matched in significance by the company's entry into a field of operations and technology never before attempted by any in the chemical industry, in the opinion of Carbide & Carbon officials.

In this connection, reports N. Y. Herald Tribune correspondent, Max Forester, what has happened here is that the company that first went deeply into the production of chemicals from natural gas has turned its attention to coal as a future raw material.

• **PROCESS.**—Bituminous coal from near-by mines is being hauled to the Gargantuan plant here in the Kanawha Valley, whose existence has been long kept a super-secret, where it is pulverized into a paste, in combination with small amounts of oil. It is then converted in a series of three 60-foot high-pressure receptacles under heat and pressure and in combination with hydrogen gas into useful liquid chemical intermediate products.

These intermediates will be converted, by more or less traditional methods, into hundreds of industrial chemicals, some known and in wide use in industry, and others—mainly some of the more complex types of hydrocarbon chemicals not easily obtained by other production processes, into uses remaining to be determined.

Difficult to accept in view of the half-dozen refining plants on the twenty-acre site—as huge and labyrinthine as some of the most complicated equipment installed either within or outside the chemical industry—is the company's terming of this as a pilot plant unit. A far smaller pilot plant operation was first installed in Carbide & Carbon's Charleston, W. Va., plant, where chemicals are manufactured from natural gas, before the present plant was built.

The five-unit plant, consisting of coal pulverizer and paste mixer, hydrogen compression station, three reaction chambers for hydrogenation, heavy-product separator and light-oil product distillation unit, now consumes 300 tons of coal a day, but can be made to consume 600 tons a day. The next plant to be built, will use 3,000 tons of coal a day.

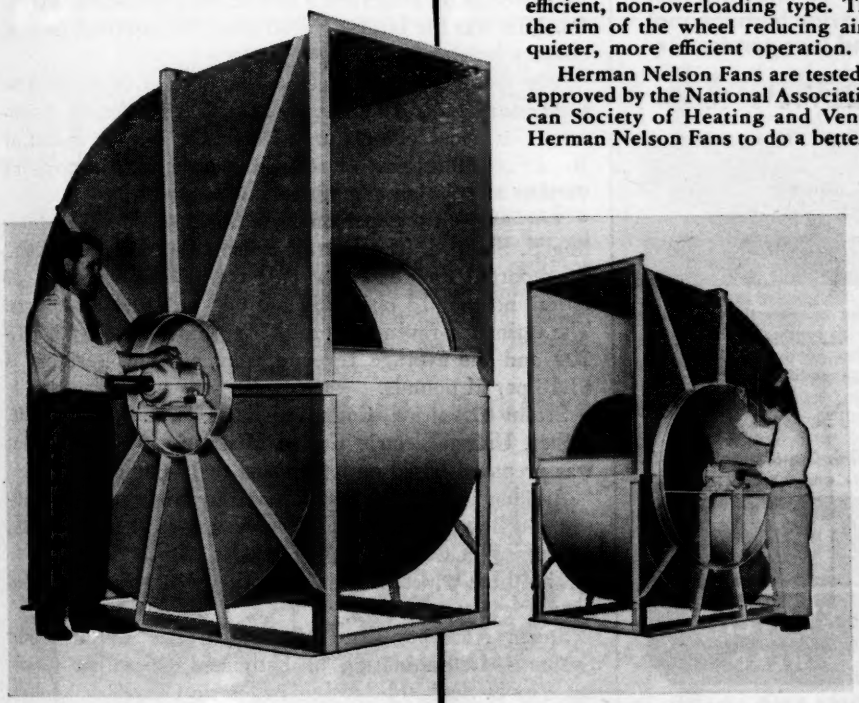
As explained on a tour of the plant by Dr. J. G. Davidson, president; Dr. George O. Curme, Jr., vice-president, and Dr. George T. Felbeck, vice-president and chief engineer for the hydrogenation project, the present plant tained from other Carbide & Carbon Chemicals plants at utilizes Pittsburgh No. 8 seam coal and hydrogen gas ob- Institute and near-by Charleston. The possible savings in the use of hydrogen of the company's own manufacture, these executives explained, was one important factor in the company's decision to go ahead with the project.

(*Continued on page* 124)

NEW FAN DESIGN!

BY...

HERMAN NELSON



INCREASES *strength—durability.*

• Herman Nelson, producer of centrifugal fans for over 35 years, again leads with major improvements. Class I and II Fans have been redesigned for better performance, trouble-free operation.

Herman Nelson Class I and II Centrifugal Fans, with wheel diameters from 40″ to 73″, are now made with ribs welded to the side sheets and extended radially from the hub. Deflection of the side sheets is reduced 80%. This assures additional strength, extra durability.

All welded construction makes fans dust-proof and leak-proof as well as extra strong.

These fans are available with either quiet, slow speed wheels or the efficient, non-overloading type. The streamlined inlet cone continues to the rim of the wheel reducing air turbulence and permitting smoother, quieter, more efficient operation.

Herman Nelson Fans are tested and rated in accordance with the code approved by the National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers. You can count on Herman Nelson Fans to do a better job.

FEATURES:

- Radial ribs for extra sturdiness.
- All welded construction.
- Easy accessibility for service.
- Smooth interior of housing permits unobstructed air flow.
- Each wheel dynamically and statically balanced.

AAF herman nelson moline illinois

HERMAN NELSON

Division of **AMERICAN AIR FILTER COMPANY, INC.**

MOLINE, ILLINOIS

RIC-WIL
QUALITY INSULATED PIPING

— — — MEANS
Higher EFFICIENCY
Longer LIFE
Lower INSTALLATION COSTS

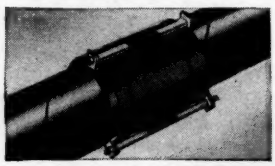
There is no stronger proof of Ric-wiL quality and dependability than the specification time after time of Ric-wiL Systems for heating and process distribution piping in major defense projects, industrial plants, and utility central heating systems.

Engineers like the way Ric-wiL Insulated Piping can be quickly adapted and laid out to meet any design or operating conditions. Contractors like the savings in installation possible with these 21-ft. prefabricated units, their easy handling and simple coupling features. Owners have the satisfaction of knowing that a Ric-wiL distribution system will provide high thermal efficiency, maximum protection, and long service life.

Condensate return piping and other lines subject to corrosive service may be coated with Ricwilite, a baked-on phenolic resin having outstanding corrosion resistance and durability.

Let a thoroughly experienced representative show you the installation and operating economies possible with Ric-wiL on your next insulated piping project.

RIC-WIL TYPE "B" COUPLER

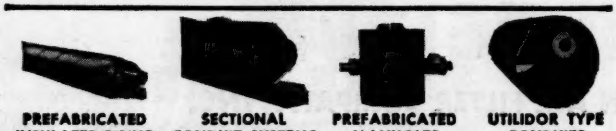


Provides a watertight conduit joint with synthetic rubber gaskets. No conduit welding required, expediting joint closures.

WRITE FOR . . . Your copy of Section 480-6. Contains valuable data on pipe selection, flexibility, and expansion.

RIC-WIL
INSULATED PIPING SYSTEMS
UNDERGROUND OR OVERHEAD

THE RIC-WIL COMPANY • CLEVELAND, OHIO
AGENTS IN PRINCIPAL CITIES
LEADERS IN INSULATED PIPING PROTECTION



PREFABRICATED INSULATED PIPING | SECTIONAL CONDUIT SYSTEMS | PREFABRICATED MANHOLES | UTILIDOR TYPE CONDUITS

HYDROGENATION

(*Continued from page* 122)

Temperatures in the hydrogenation reaction chambers range between 300 and 500 degrees centigrade, while pressures run up to 4,000 pounds a square inch. The center chamber in the group of three hydrogenation units, consisting of a preheater, converter and hot separator, is where the actual combination of the hydrogen and carbon in the coal takes place, and herein is installed an inner receptacle which is the world's largest stainless-steel forging.

The plant, while easily adaptable to the manufacture of synthetic gasoline, if the need should arise, will be wholly devoted normally to making chemicals. Emerging from the hydrogenation units are a heavy product, consisting of unreacted material and oil which is recycled for use in coal-pasting, as well as a raw light oil product, which is further divided into tar acids, tar bases and neutral hydrocarbons.

NDHA CONVENTION

held at Skytop, Pa.; many technical papers presented; sessions well attended.

Two hundred members and guests were present at the forty-third annual meeting of the National District Heating Association held June 3 to 6 at Skytop Lodge, Skytop, Pa. This was the largest registration for meetings held at country hotels.

The first session on Tuesday morning was devoted to the annual address by President Alfred T. Veness, Rochester Gas and Electric Corp., Rochester, N. Y.; report of John F. Collins, Jr., secretary-treasurer, and reports of various association committees.

• **PAPERS.**—In a paper on New Business, 1951, by Sterling S. Sanford, The Detroit Edison Co., Detroit, Mich., he reported that 849 new customers were added in 47 cities and that 13 cities did not add any new customers. The estimated revenue from this new business is $2,271,709 and the average revenue from all new business is $1.18 per M pounds.

Steam Extension Costs vs. Revenue, by William C. Kaber, Union Electric Co. of Missouri, is a paper that was prepared based on letters sent to 19 companies.

Another paper of this group was by Norman H. Davidson, Rochester Gas and Electric Corp., Rochester, N. Y., on Survey of Competition—Coal, Oil, Gas.

The three papers on air condition that were presented are:

Steam Absorption vs. Mechanical Air Conditioning Systems—Determination of Estimated Operating Costs, by Wirt S. Scott, Philadelphia Electric Co., Philadelphia, Pa.

Steam Absorption vs. Mechanical Air Conditioning Systems—Estimated Owning and Operating Costs for a 30-Story Office Building, by Edward Schulz, Pittsburgh Manager, Carrier Corp., Pittsburgh, Pa.

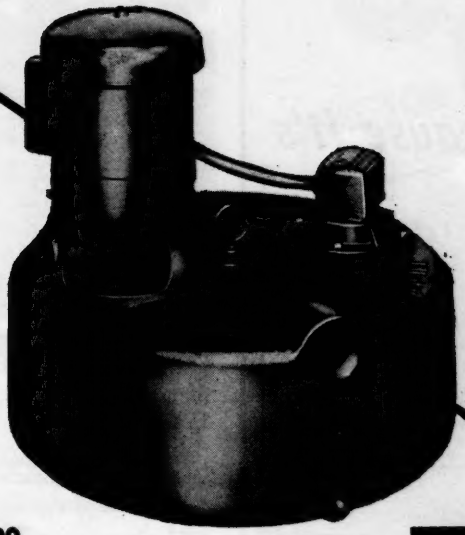
Operating Experience on 1,500-Ton Steam Operated Air Conditioning System in 36-Story Office Building, 100

(*Continued on page* 126)

LOW PRESSURE SYSTEM

Condensate Pumps

weil Dependable PUMPS



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Low Return Connection
Low Speed, Long Life
Cast Iron Receiver
Single or Duplex
Low Water Line
Capacities 500 to 10,000 Sq. Ft. E.D.R.

For Single Units
Dimensions: 10 gal. receiver
Diameter—21"
Height of return above floor—6⅞"

For Single or Duplex Units
Dimensions: 15 gal. receiver
Diameter—25½"
Height of return above floor—7 3/16"

Fig. TVC 126

ASK FOR BULLETIN TVC 300

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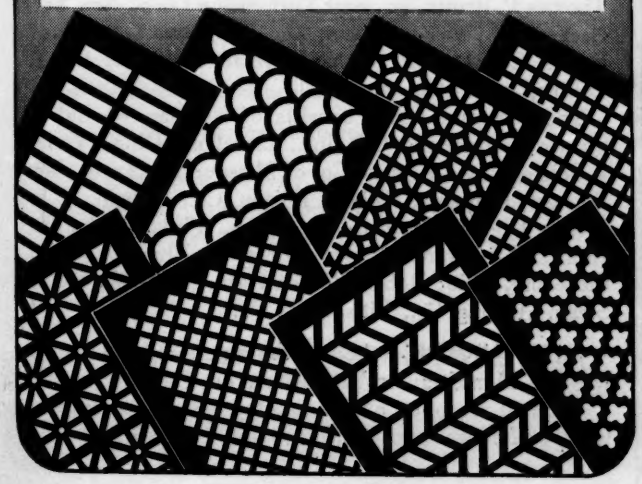

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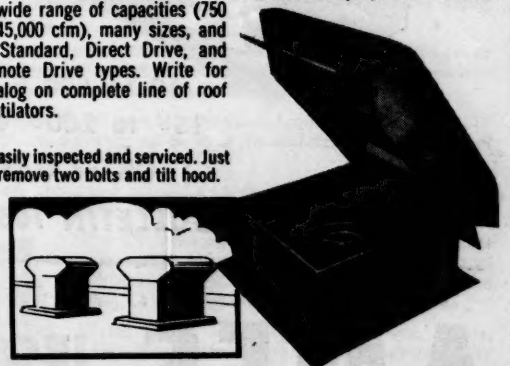

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Representatives in principal cities are listed in our catalog in Sweet's Architectural File, Section 20b.

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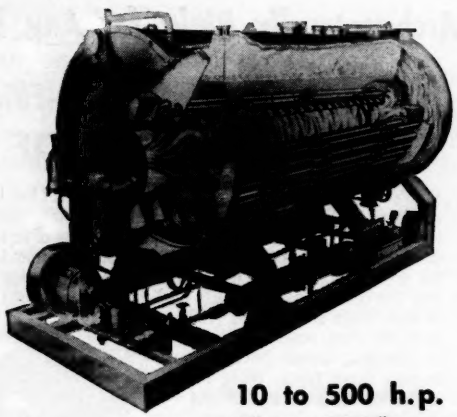
EASY TO CLEAN



10 to 500 h.p.
15# to 200# w.p.
OIL or GAS

WRITE FOR BULLETIN 1050

AMES IRON WORKS
BOX H-7 OSWEGO, N. Y.
Builders of Better Boilers Since 1848

NDHA CONVENTION

(*Continued from page* 124)

Park Avenue, New York City, by James H. Morrow, Building Manager, 100 Park Ave., New York, N. Y.

The following five papers were presented as part of the session devoted to the Commercial Relations Committee:

Seasonal Degree Day Statistics for the United States, by Herbert C. S. Thom, Climatological Specialist, U. S. Weather Bureau, Washington, D. C., and Visiting Professor in Statistics, New York State College of Agriculture, Cornell University, Ithaca, N. Y.

Baseboard Heating, by Roger A. Parson, Board of Water and Electric Light Commissioners, Lansing, Mich.

Modern Heating Systems of Large Buildings, by Henry J. Cushing, New York Steam Corp., New York, N. Y.

Relative Overall Economics of Reducing Customer Demands, by Carl B. Sprenger, The Detroit Edison Co., Detroit, Mich.

Snow Melting Systems, by J. L. McKinley, Public Service Co. of Colorado, Denver, Colo.

Other engineering papers presented at the convention are:

Symposium on Operation and Maintenance of Steam Distributing Systems of Everett C. Russell, Philadelphia Electric Co., Philadelphia, Pa.; Louis J. Hoeflinger, New York Steam Corp., New York, N. Y.; Glen D. Winans, The Detroit Edison Co., Detroit, Mich.

Progress Report on Studies of Water Hammer in Steam Lines Being Carried on by The Detroit Edison Co., by Ernet T. Smith, The Detroit Edison Co., Detroit, Mich.

Steam Distribution Systems Analyzed by Nonlinear Electrical Analogy Method, by Malcolm S. McIlroy, professor of electrical engineering, Cornell University, and Chao Kong Chow, graduate student in electrical engineering, Cornell University.

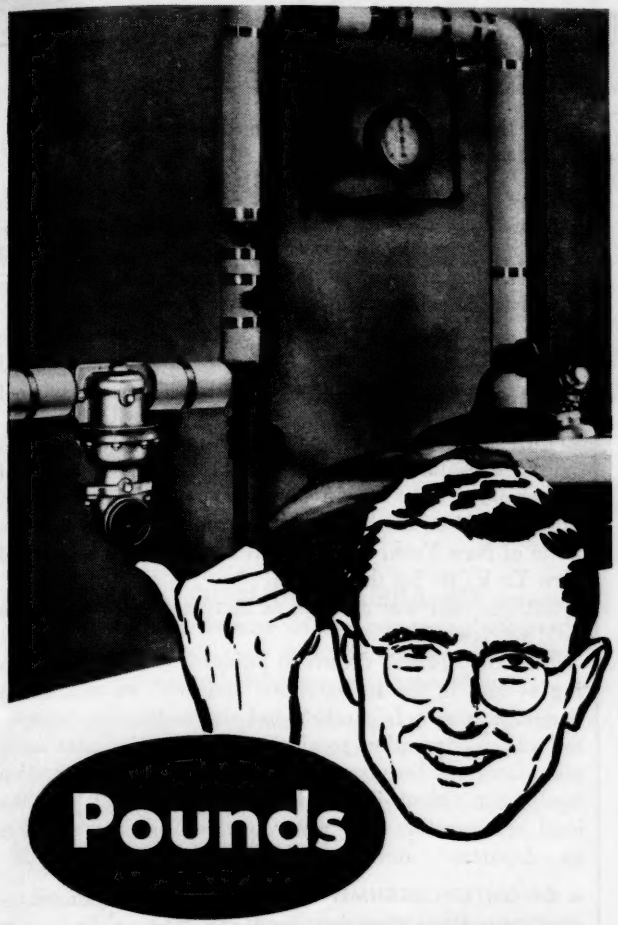
Generation of Steam with Cyclone Furnaces, by Fred G. Ely, consultant, Babcock & Wilcox Co., Alliance, Ohio.

Not mentioned are the papers relating to rates and meters, and reports of special committees.

• **NEW OFFICERS.**—The new officers of the association are president, Percy A. Hyde, Ohio Edison Co., Akron, Ohio; first vice-president, Charles W. Deeg, Philadelphia Electric Co., Philadelphia, Pa.; second vice-president, Thomas P. Brown, Jr., New York Steam Corp., New York, N. Y.; third vice-president, Leo F. Collins, The Detroit Edison Co., Detroit, Mich.; secretary-treasurer, John F. Collins, Jr., Pittsburgh, Pa.

The executive board consists of Norman W. Calvert, Spence Engineering Co., Inc., Cleveland, Ohio; Vernon J. Suche, Union Electric Co. of Missouri, St. Louis, Mo.; Edward J. Flahie, Toledo Edison Co., Toledo, Ohio; Joseph Kildare, Yarnell-Waring Co., Philadelphia, Pa.; Homer A. Lawrence, Cleveland Electric Illuminating Co., Cleveland, Ohio; Robert B. Donworth, Alleghany County Steam Heating Co., Pittsburgh, Pa.

• **ENTERTAINMENT.**—Among the entertainment features was the Manufacturers' Reception on Tuesday evening, the annual reception on Wednesday evening, sightseeing trips, golf tournament and other outdoor sports.



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- **No stuffing box** to leak or cause friction.
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Cyclotherm Steam Generators means *Quick Steam* when called for. This reduces fuel consumption during "coming up" periods and permits continuous, quick adjustment to load changes. The Cyclotherm Boiler is able to deliver steam faster because of its extremely high heat transfer and the fact that it has much greater water circulation since the combustion chamber is radiating heat evenly in all directions and along its entire length.

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Boilers are designed for oil or gas operations from 18 thru 500 h.p., 15 to 200 lbs. operating pressure.

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3/4 TO 100 H.P.
CONDENSING
...without water!

ANY SIZE COMPRESSOR
CAN BE
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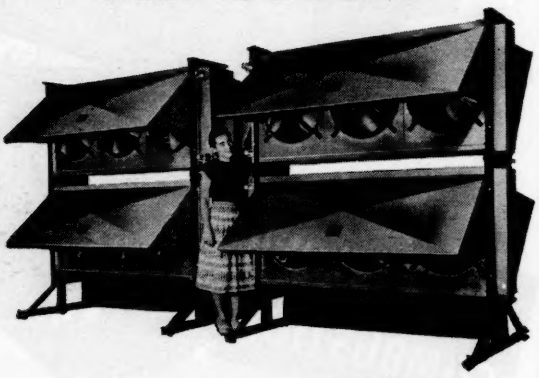
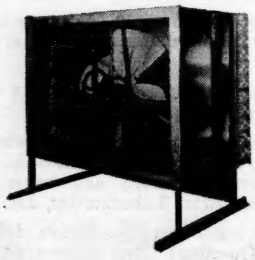


40 TON

with
UNICON*
by KRAMER



Eliminates all water problems . . . because you don't use water with UNICON! Stands, hoods and wind deflectors are available for simplified outside mounting.

20 TON

WRITE FOR BULLETIN U-210

*Patent Pending

KRAMER TRENTON CO.
Trenton 5, N.J.

REFRIGERATION REGULATION

attempted by four bills considered at New York City hearing.

Four bills designed to require the employment of licensed refrigeration operators for air conditioning equipment not requiring personal supervision at present, and the licensing of operators for such equipment were introduced for consideration by the New York City council.

Int. No. 4 would require 24 hours a day attendance by a licensed operator in any premises in which the combined capacity of all machines is equivalent to 10 tons of refrigeration.

Int. No. 45 gave as the detailed requirements for licensed operators that the applicant must be 21 years of age or older, must have five years experience in the refrigeration field or the holder of an engineer's license in the State of New York, and in addition must be a resident of New York City for three years.

Int. No. 487 was directed at increased safety in household refrigeration.

Int. No. 524 was drawn to establish a complete licensing system in the refrigeration industry. In addition to licensing every refrigeration and air conditioning contractor and refrigeration serviceman, it also includes many manufacturers because they sell and install refrigeration equipment. Others included are firms that deal in household refrigerators and water coolers, appliance dealers and department stores.

• **OPPOSITION ARGUMENTS.**—Considerable organized opposition to these measures developed. At a public hearing on May 29, Arnold Witte of the Commerce and Industry Association of New York, Inc., pointed out that Int. No. 4 would affect every apartment house with 60 families or move, every office building, hotel, restaurant, store and theater in the city. It would make mandatory the employment of four operators for each occupancy within the definition of this bill.

Int. No. 45 would make it more difficult to obtain a license and it would therefore accentuate an already acute shortage of refrigeration operators.

He stated that Int. No. 524 proposes a second system of licensing, inspection, permits and controls by the Department of Housing and Buildings, superimposed on the already existing controls and authority vested in the fire department. It would create a condition where one department would check on another so that the industry would be hampered by inter-departmental checkup.

Another speaker at this hearing called attention to the fact that since the present wage scale of licensed operators is from $85 to $120 per week, employment of four operators for a business place would be about $400 a week. In New York City last year over $50 million of refrigeration and air conditioning equipment was sold, excluding household refrigerators. In this is over 3,200 floor air conditioners. The existence of this bill, he said, discouraged many plans for refrigeration in the city.

At this hearing, Councilman Kranis who had introduced No. 4 and 487, announced that he had ordered these bills filed which means that they have been withdrawn. From the tone of the meeting, it is believed that No. 487 will also be withdrawn.

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VALUE — QUALITY — FAIRBANKS synonymous today because of the reputation achieved during a half century of progressive valve development and field service dependability.

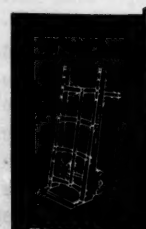
The 0260—300 pound Bronze Gate Valve—is a typical valve, a typical value.

TWO-PIECE UNION BONNET
Strength, quick easy disassembly, no sliding or scraping of seat between body and bonnet.

RADIAL SEAT OF UNION BONNET
Leakproof body-bonnet joint, rigid alignment.

SOLID NICKEL ALLOY WEDGE
guided for tight closure, corrosion resistant.

Fig. 0260 BRONZE GATE VALVE—NON RISING STEM
300 lbs. steam working pressure at 550°F.
(0264—BRONZE GATE VALVE—RISING STEM)



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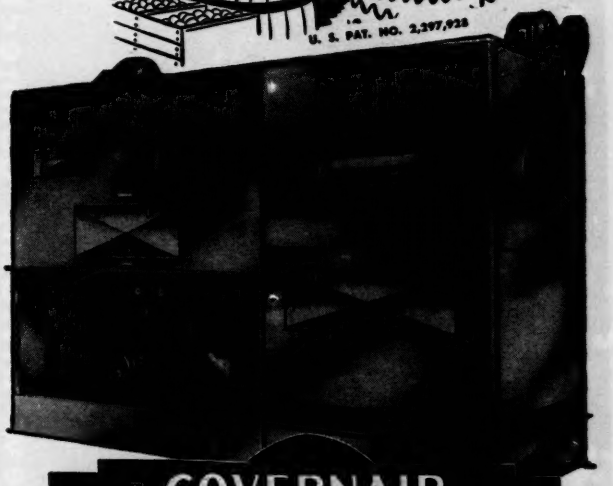

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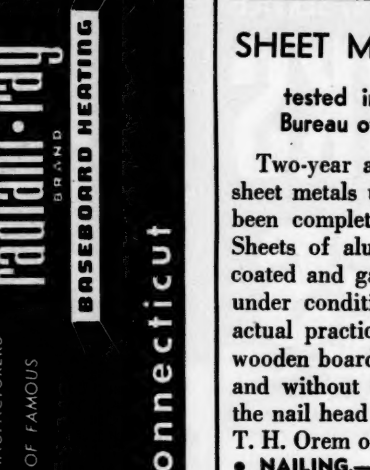
YOU CAN DO A CUSTOM-MADE JOB WITH THESE STANDARD FACTORY-MADE PARTS!



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- Easy to install fittings pre-fabricated and punched to simplify installation — save time — increase profits.
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BASEBOARD HEATING

SHEET METAL WEATHERING

tested in two-year atmospheric exposure trials at Bureau of Standards.

Two-year atmospheric exposure tests of a number of sheet metals used in building construction have recently been completed by the National Bureau of Standards. Sheets of aluminum and zinc alloys and of aluminum-coated and galvanized steel were exposed to the weather under conditions closely approximating those found in actual practice. Each metal tested was fastened to bare wooden boards with nails of various materials, both with and without neoprene or lead sealing washers between the nail head and the sheet. The study was conducted by T. H. Orem of the NBS corrosion laboratory.

• **NAILING.**—Severe corrosion may occur at the point of nailing if the wrong nailing is used, even with building sheet that is highly serviceable when properly installed. Although some other types of nailing will often give good service, the NBS study indicates that, in general, use of aluminum nails and carbon-black-filled neoprene sealing washers will give the greatest assurance of long trouble-free service, even under severe conditions.

The Bureau maintains two atmospheric-exposure test stations, one on the roof of a building on the Bureau grounds at Washington, D. C., and one 10 feet over salt water near Norfolk, Virginia.

In the present NBS tests, 3-by-4-inch specimens of the various sheet metals, variously fastened, were exposed to weathering at both test stations. Nails of aluminum alloy, bare steel, cadmium-coated steel, galvanized steel, and copper were used with the aluminum alloy, aluminum coated steel, and galvanized sheets. Only bare steel and galvanized nails were used with the zinc-alloy sheets. Sealing washers of both regular neoprene and carbon-black-filled neoprene were investigated, as well as the more usual lead washers. In installing aluminum, good practice calls for a layer of water-resistant building paper or asphalt-impregnated felt between the metal and the wood, but in the NBS tests this protective layer was purposely omitted. Sufficient sets of specimens were exposed to permit removal of complete sets after 3, 6, 12, and 24 months, and one set is being allowed to remain in the exposure racks for an indefinitely longer period.

• **ALUMINUM.**—Results of the two years' exposure clearly demonstrate the importance of avoiding certain fastening practices, particularly with aluminum. It is well established that aluminum sheet properly installed is a serviceable building material in most environments. But, as the NBS tests show, bare steel nails, or other uncoated nails except aluminum, can cause serious corrosion of the surrounding aluminum. Bare copper nails, furthermore, showed themselves to be even more corrosive than steel nails to the surrounding aluminum—a phenomenon readily appreciated by those familiar with the subject, but one of which some installers of sheet aluminum have apparently been unaware. The cadmium-plated and the galvanized (zinc-coated) nails caused no corrosion while their coatings remained intact. The cadmium itself corroded away in some cases, however, exposing the steel nail, and the zinc showed signs of doing so. Since the

(*Continued on page* 132)

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First in Interior Fire-Protection Equipment

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Exclusive scroll effect design, built in assures you of efficient performance against normally encountered static pressures.

Air-Vans are weatherproof and self contained — shipped to your job site completely assembled, ready to install. You get all the economies of direct connection in a superb low silhouette unit. Air Vans have been built to a standard of rugged dependability. Compare Air-Van material specifications and you'll see the difference.

Performance Ratings CERTIFIED by an independent laboratory.
Cap: 150-11,000 CFM: Static Pressures to 1¾".
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We have quite a following too—

SKIDMORE'S
following of satisfied customers has grown steadily in the past 30 years.

In hotels, hospitals, laundries, industrial and institutional projects throughout the country, wherever specific requirements call for a heating pump, there, you will find a Skidmore Pump giving years of dependable service . . . this kind of outstanding performance with the minimum amount of upkeep increases the Skidmore Pump following, making it today's most popular heating pump.

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For complete story on these and other type pumps, send for your Skidmore Pump bulletins today.

TYPE UV
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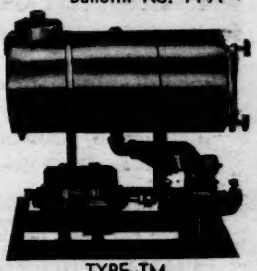
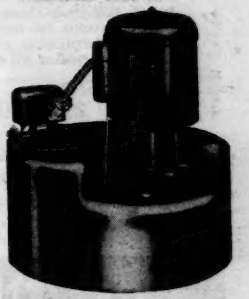


TYPE TM
Bulletin No. 17



TYPE CV
Bulletin No. 21

SKIDMORE CORPORATION
ST. JOSEPH MICHIGAN

Skidmore Pumps

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Modulating Heat Control

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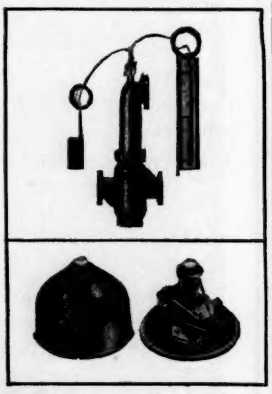
Ninety-one distinctive, custom built homes have been completed in this exclusive club development comprising 5000 acres of unspoiled country near Butler, New Jersey, 30 miles northwest of New York.

Prominent among outstanding modern improvements built in by the architect, Carl Kemm Loven, A.I.A., of Glen Rock, N. J., is the extensive use of

RADIANT HEATING

with Sarcotherm Control, thus assuring complete comfort for the occupants under all weather conditions.

For full information ask a Sarcotherm engineer to see you—there is one near you—or write for complete catalog.



The heart of the Sarcotherm control system for radiant or forced hot water heating is this unique control valve. It is actuated by liquid expansion thermostats, one located outside the building and one in the valve itself. Between them they anticipate changes in heat loss ratio, thus maintaining comfort temperatures under all conditions.

The Sarcotherm Comfort Control "Thermoray" is an extremely sensitive thermostat affected by both radiation and convection.

Sarcotherm

21A

A SARCO PRODUCT

SHEET METAL WEATHERING

(*Continued from page* 130)

steel can begin its corrosive action on the aluminum as soon as the protective coatings have corroded away, the use of cadmium-plated or galvanized-steel nails seems questionable when maximum trouble-free life is desired from aluminum sheet. As would be expected, aluminum nails caused no corrosion of aluminum sheet in the tests.

The aluminum-coated specimens behaved similarly to the aluminum-alloy specimens at both Washington and Norfolk. Neither the galvanized nor the zinc-alloy sheets showed more than slight corrosion of any type under any conditions of use. The galvanized sheets showed no corrosion from aluminum, galvanized, and cadmium-plated nails, and only slight corrosion from bare steel and copper nails. Similarly, the zinc alloy sheets showed no corrosion from galvanized nails and only slight corrosion from bare steel nails.

Among those familiar with corrosion theory, it is well known that when two dissimilar metals are in contact with each other, one or the other will generally tend to corrode if moisture is present. This is essentially an electrochemical phenomenon, and the relative positions of the two metals in the electrochemical series generally determines which of the two will corrode.

• **WASHERS.**—Sealing washers are commonly used under the nail heads when metal building sheets are nailed, and this is a highly desirable practice for several reasons. In addition to their waterproofing value, proper sealing washers reduce corrosion possibilities by keeping the nail out of contact with the sheet metal. With proper sealing washers, it therefore makes less difference what nails are used. Some washers may not continue to give a good seal, however, and in any event electrical corrosion currents may flow over the surface of the washer when moisture is present. It therefore seems advisable, where maximum sheet-metal life is important, to use suitable washers in combination with nails that would not cause corrosion even in the absence of the washers. Such conservative practice will naturally have most value under severe weathering conditions.

Carbon-black-filled neoprene washers were found to weather better than ordinary neoprene washers in the NBS tests; the latter tended to harden. Lead sealing washers caused no appreciable corrosion of specimens exposed at Washington but did cause substantial corrosion of specimens exposed in the marine atmosphere at Norfolk.

Additional exposure time will be required to establish the relative resistance of properly fastened sheets of the different metals to weathering under identical conditions. All the sheets investigated showed only very slight corrosion due to the atmosphere alone—at a distance from the nails—at the end of the two-year period.

The NBS tests are reported in more complete form in a recent NBS Building Materials and Structures Report, "Atmospheric Exposure Tests of Nailed Sheet Metal Building Materials," BMS 128, available for 20 cents from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

ABSTRACTS AND REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

PLUMBING DESIGN AND INSTALLATION

An overall picture of plumbing is presented in the third edition of How to Design and Install Plumbing, by A. J. Matthias, Jr., and Esles Smith, Sr., respectively supervisor of training, Nash-Kelvinator Corp., Kenosha, Wis., and instructor, Palomar College, Vista, Calif.

Plumbing has earned an important place in every day living. Community health depends upon the maintenance of high standards by the profession and good design based upon sound engineering principles. The importance of properly designed systems and good installations are emphasized not only because of the health angle but so that there can be the proper enjoyment and use of the many plumbing facilities that are now available.

This volume may be considered as a good introductory book to acquaint the reader with the various appliances and fittings, and how they are installed with information on the sizing of pipe. The previous one was carefully revised and changes made in text to bring it up to date.

In a pocket in the back of the book are a full set of blueprints for a six-room, two-bath residence. These drawings are used as illustrative material in working out design problems and in explaining plumbing specifications.

How to Design and Install Plumbing, A. J. Matthias, Jr., and E. Smith, Sr. Cloth bound, 5½ x 8¼ inches, 444 pages. Published by American Technical Society, 848 E. 58th St., Chicago 37, Ill. Price, $3.95.

• • •

STANDARDS ON REFRACTORY MATERIALS—The 37 ASTM standard and tentative specifications, classifications, test methods and definitions pertaining to refractories are assembled in the 1952 edition of Manual of ASTM Standards on Refractory Materials. This takes the place of the 1948 edition. New Material includes methods of test for modulus of rupture and for permanent linear change on firing of castable refractories in an atmosphere of carbon monoxide, a survey of refractory service conditions in the incineration of refuse and a proposed extensive glossary. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $3.

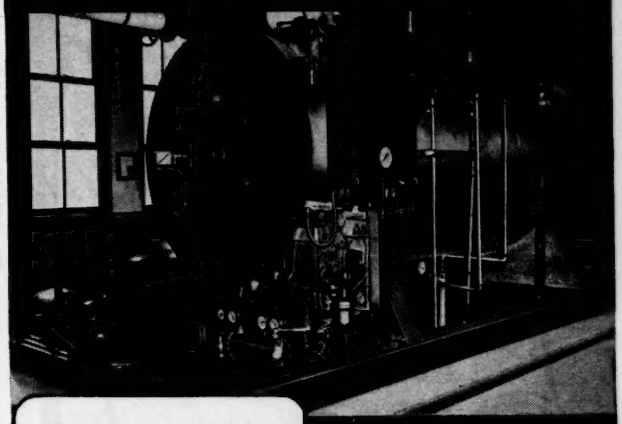
SMALL PIPE PERIMETER HEATING—A new small pipe warm air perimeter heating guide, 24 pages, has just been published by National Warm Air Heating and Air Conditioning Association, Cleveland, Ohio. Identified as Manual 10, this book is a tentative manual for use in designing and installing low velocity heating systems, using 4-inch round pipe with winter air conditioning furnaces rated at a total external static pressure of 0.20 inch water gage, or comparable, at sea level, and with a temperature rise range of 70-100 deg through the furnace.

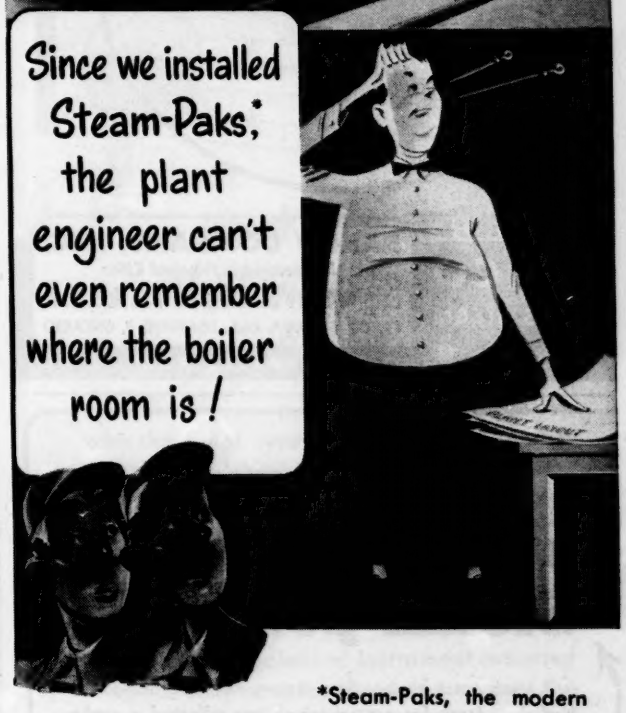
The purpose of the tentative manual is to outline standards for heating contractors desiring to install small pipe systems and for inspecting agencies to use as a basis for acceptance of installations.

Two types of small pipe systems are described. These are the individual pipe system and the extended plenum

(*Continued on page* 134)

$20,000 SAVED— This Steam-Pak generator installed in Stevens Linen Associates, Webster, Mass. saved $20,000 in operating during the first year of operation.





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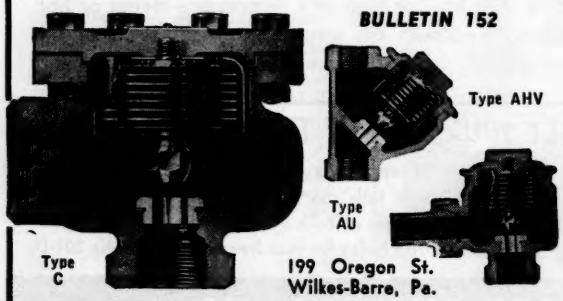
BULLETIN 152



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(*Continued from page* 133)

system. The design and installation suggestions given cover the use of small pipe perimeter heating in one and two-story houses with full or partial basements and in houses constructed over crawl spaces. National Warm Air Heating and Air Conditioning Association, 145 Public Square, Cleveland 14, Ohio. Price, 75 cents per copy.

STAINLESS STEEL PIPE—The revised edition of American Standard B36.19 on Stainless Steel Pipe contains data on new schedules of thickness. Schedule 10S pipe is the first new schedule of thickness to be standardized in over 15 years and is about one-half the weight of Schedule 40S. The new Schedule 5S pipe is approximately one-third lighter than Schedule 10S. The new schedules provide greater opportunity for economy in the cost and use of this material. American Standards Association, 70 E. 45th St., New York 17, N. Y.

AIR POLLUTION CONTROL IN LOS ANGELES COUNTY—The second technical and administrative report on air pollution control in Los Angeles County has been issued by the Los Angeles County Air Pollution Control District. This report discusses the importance of smog as it affects the community, how smog may be controlled, chemical and physical properties of Los Angeles smog, and other pertinent data as related to the problem of air pollution control in the county. Department of Los Angeles Air Pollution Control District, 5201 Santa Fe Avenue, Los Angeles 58, Calif.

RADIOLOGICAL MONITORING METHODS AND INSTRUMENTS—To supply information on the methods to be taken to prevent overexposure of personnel to radiation from radioactive materials, Handbook 51 on Radiological Monitoring Methods and Instruments has been published. This paper-bound booklet of 33 pages covers the general principles of hazard control, detectors, measuring instruments, radiation-survey methods, and data on both air and water sampling analysis. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 15 cents.

SPECIFICATIONS FOR STEEL PIPING MATERIALS—A new edition has been compiled by the ASTM Committee A-1 on Steel. This edition of ASTM Specifications for Steel Piping Materials contains material on pipe used to convey liquids, vapors, gases at normal and elevated temperatures, steel tubes for refinery service, heat exchangers and condenser tubes, and boiler, superheater, and miscellaneous tubes. New specifications cover seamless and welded steel pipe and tubes for low temperature service; seamless ferritic alloy steel pipe for high temperature service; forged or rolled carbon and alloy steel flanged, forged fittings, and valves and parts for low temperature service, ferritic and austenitic steel castings for high temperature service; and ferritic steel castings for pressure containing parts suitable for low temperature service. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $3.50.

• George R. Beese, with C. A. Dunham Co. from 1925 to 1941, recently rejoined the company as assistant to the president, supervising engineering and manufacturing activity. He started in the research department in 1925 upon graduation from Iowa State College at Ames. In 1930 he was made head of research and product development. A year later Dunham appointed him manager of the Marshalltown plant. At the beginning of World War II, Mr. Beese was called upon to organize the Iowa Division of the War Production Board; he served as its director during the war years. His headquarters will be in the company's executive offices, in Chicago.

• The appointment of George W. Brown as executive Engineer has been announced by the Wagner Electric Corp. Mr. Brown has been with the company since 1926, having joined as a student engineer following his graduation from Ohio State University. In January, 1937, he was appointed personnel director. In December 1942, Mr. Brown, who had been a Reserve Officer since 1930, was called to active service. He returned to inactive status in October, 1945. Returning to the Wagner Electric Corporation after his war service, Mr. Brown was appointed Industrial Relations Director.

WHAT READERS SAY

Relieving Pressure in Combustion Chamber

EDITOR, HEATING AND VENTILATING

There seems to be no standards on combustion chamber relief requirements for boilers burning gas or oil. Since some boiler explosions are covered by insurance, it would seem that the Underwriters should be interested in establishing area of relief outlets for the various conditions. These reliefs should be divided into two classes; those for package boilers and those for standard boilers with conversion oil or gas burners.

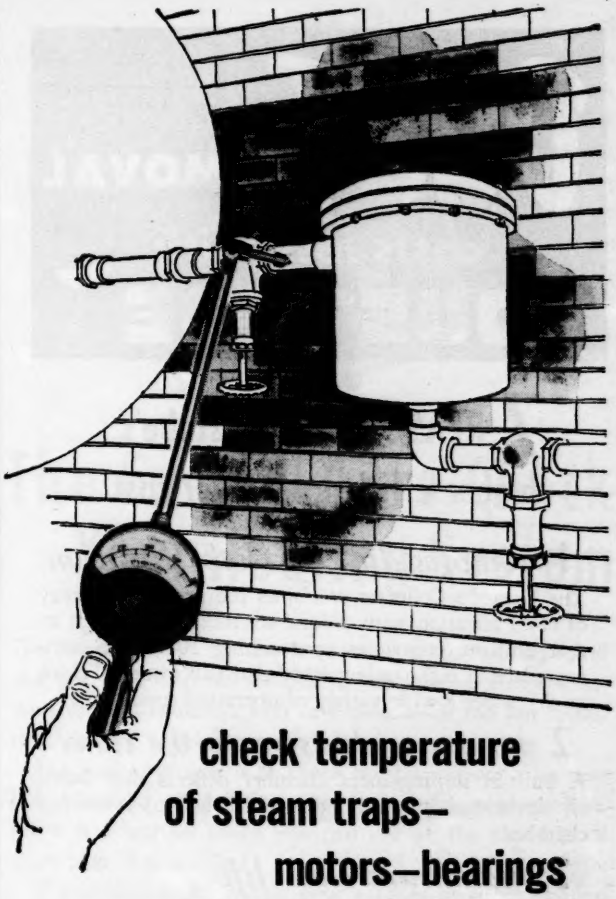
On account of the small furnace or combustion space volume in most of the package type oil and gas burning boilers, makers furnish very small relief area. One package boiler manufacturer furnishes about one-third of a square foot of spring loaded relief area on practically all sizes of boilers. Another manufacturer uses approximately one-third square foot area up to 40 hp, approximately one-half square foot up to 80 hp and a little less than a square foot up to 300 hp, these relief areas being located in the second pass.

Where a standard boiler is used with a gas or oil burner, sometimes a relief area of one-half the tube area of one pass of tubes is advised. Many times this type of boiler has automatic secondary air intakes that would act as a relief in case of explosion.

It is quite common to use barometric dampers for draft control. These can be made to open in case of furnace explosion, or are so light that the damper would blow out of the frame.

Sometimes the firing doors on H.R.T. and fire box return boilers have their notches cut off to allow these doors to open in case of high furnace pressure. However, in these

(*Continued on page* 136)



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No metal ever contacts or abrades the filtering area of the cloth. Tubes are adjustable so cloth need never be under tension. Gentle but effective shaking action.

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One man working alone on the clean air side can install tubes—no tools required. The cloth tubes can be replaced in groups as time permits during off hours causing no interruption in production use of equipment.

5 *easy inspection*

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(*Continued from page* 135)

cases, the doors must have a spring to prevent them opening when a furnace puff occurs on starting.

On a recent furnace explosion on a 70 hp return fire box boiler, an 18 inch diameter barometric draft damper was blown out of its frame, the rear cast iron doors of combustion chambers were wrecked and the burner blown out of its brick setting. Also, a water column was cracked. The fuel was gas. It was necessary to rebuild the front brick wall of ash pit. This was a typical installation with fairly high brick ash pit, with 12 inch walls. The balanced damper was located on face of uptake close to boiler.

All this would tend to show that the relief should be from furnace; pressure will not be relieved quickly enough through tubes.

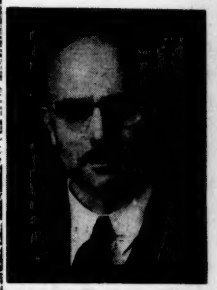
It would be of help to the consulting engineer if the Underwriters, A.S.H.V.E., Oil Heat Institute, A.S.M.E., or other organizations would set certain standards of size and location of relief areas. Whether these areas and locations should differ for gas and oil, and whether they should be dependent on furnace volumes, horsepower capacity, tube area or other considerations, should be matters for investigation.

Allen S. Crocker
Consulting Engineer

Rochester, N. Y.

GETTING PERSONAL

E. B. Penrod (*Operating Performance of a Heat Pump Water Heater*, page 63), is head of the department of mechanical engineering, University of Kentucky, and he has had an extensive background in both teaching and research.



E. B. Penrod

He received his B. S. in Mechanical Engineering and an M. S. in Physics at Purdue University, and an M.M.E. at Cornell University. He completed post graduate work in physics and mathematics at the University of Chicago, and the University of Michigan. Mr. Penrod had a fellowship in mechanical engineering at Cornell and a scholarship at the University of Chicago.

During World War I he was in the Science and Research Division of the U. S. Signal Corps.

Prof. Penrod has taught at Purdue University, Western Reserve University, Hillsale College, and Illinois Institute of Technology. From 1942 to 1946 he was a research engineer at Armour Research Foundation of Illinois Institute of Technology. In 1945, while at the Armour Research Foundation, he made an examination of the heat pump for one of its clients and while working on this project, traveled from coast to coast making a study of commercial and domestic heat pump installations in the United States. He is the author of fourteen articles on the heat pump published in the technical press.

His affiliation with the teaching staff of the University of Kentucky dates back to June, 1946.

H. Molk

Howard Molk (*Computing the Hot Water Demand*, page 70) is a native of Brooklyn, N. Y., a community nationally known as the home of the Brooklyn Dodgers.

He received his BME degree in 1949 from The Cooper Union, School of Engineering. While serving with the Division of Buildings, New York City, as junior mechanical engineer, he became familiar with the design and installation of plumbing and drainage systems for hospitals, health centers and other public buildings. In 1950 he entered the employ of Gibbs & Hill, Inc., engineers, New York City. His work includes the design of plumbing, drainage, and heating and ventilating systems for power plants and industrial buildings.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

ASME MEETING—Fall meeting of the American Society of Mechanical Engineers, at the Sheraton Hotel, Chicago, Ill. C. E. Davies, secretary of the Society, 29 West 39th St., New York, N. Y. ..... **SEPTEMBER 8-11, 1952.**

INSTRUMENT CONFERENCE AND EXHIBIT—Seventh National Instrument conference and exhibit, in Cleveland, Ohio. John McCaffery, assistant executive secretary of the Society, 1319 Allegheny Ave., Pittsburgh 33, Pa. ..... **SEPTEMBER 8-12, 1952.**

AGA CONVENTION—Annual convention of the American Gas Association, in the Auditorium, Atlantic City, New Jersey. Secretary of the Association, 420 Lexington Avenue, New York, N. Y. ..... **OCTOBER 27-30, 1952.**

GAMA EXPOSITION—Exposition of the Gas Appliance Manufacturers Association at Convention Hall, Atlantic City, N. J., held in conjunction with the AGA convention. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. ..... **OCTOBER 27-31, 1952.**

ASA MEETING—34th annual meeting of the American Standards Association, at the Waldorf Astoria Hotel, New York, N. Y. Secretary of the Association, 70 East 45th Street, New York. ..... **NOVEMBER 19, 1952**

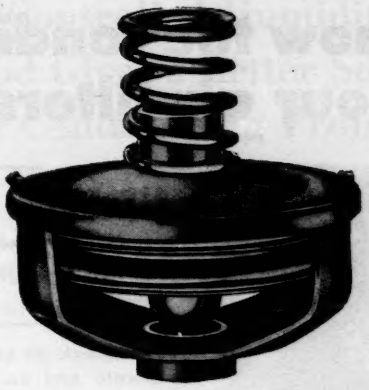
ASME MEETING—Annual meeting of the American Society of Mechanical Engineers, at the Hotel Statler, New York, N. Y. C. E. Davies, secretary of the Society, 29 West 39th St., New York, N. Y. ..... **NOVEMBER 30-DECEMBER 5, 1952**

NATIONAL POWER SHOW—20th National Exposition of Power and Mechanical Engineering, under the auspices of the American Society of Mechanical Engineers, at Grand Central Palace, New York, N. Y. Charles F. Roth, manager of the exposition, Grand Central Palace, New York 17, N. Y. ..... **DECEMBER 1-6, 1952**

AUTOMOTIVE ENGINEERS MEETING—Annual meeting and engineering display of the Society of Automotive Engineers, at at the Sheraton-Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary and general manager, 29 West 39th St., New York, N. Y. ..... **JANUARY 12-16 1953.**

HEATING WHOLESALERS MEETING—The annual meeting of the National Heating Wholesalers Association, Inc., at the Congress Hotel, Chicago, Ill. E. L. Wyman, executive secretary of the Assaciation, 637 Union Commerce Building, Cleveland 14, Ohio. ..... **JANUARY 26-28, 1953.**

ASHVE EXPOSITION—The Air Conditioning Exposition, under the auspices of The American Society of Heating and Ventilating Engineers, at the International Amphitheatre, Chicago, Ill., to be held in conjunction with the society's 59th annual meeting. Write to exposition management, International Exposition Co., Inc., Grand Central Palace, New York 17, N. Y. ..... **JANUARY 26-30, 1953.**



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DEGREE-DAYS FOR MAY, 1952

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 24th Year of Publication of Monthly Degree-Day Data

City	May		
	1952	1951	Normal
Abilene, Texas (A)	26	7	0
Albany, New York (A)	(a)	220	183
Albuquerque, New Mexico (A)	58	81	40
Alpena, Michigan (C)	436	330	465
Anaconda, Montana (C)	(a)	504	517
Asheville, North Carolina (C)	61	100	71
Atlanta, Georgia (C)	18	19	0
Atlantic City, New Jersey (C)	159	139	220
Augusta, Georgia (A)	11	12	0
Baker, Oregon (C)	364	383	431
Baltimore, Maryland (C)	77	74	22
Billings, Montana (A)	266	249	316
Binghamton, New York (C)	311	222	254
Birmingham, Alabama (A)	20	39	0
Bismarck, North Dakota (A)	297	257	338
Block Island, Rhode Island (A)	315	269	378
Boise, Idaho (A)	235	254	236
Boston, Massachusetts (A)	238	215	245
Bozeman, Montana (C)	(a)	413	471
Buffalo, New York (A)	339	246	335
Burlington, Iowa (A)	174	121	(a)
Burlington, Vermont (A)	402	302	273
Butte, Montana (C)	(a)	504	502
Cairo, Illinois (C)	46	30	0
Charleston, South Carolina (C)	2	0	0
Charlotte, North Carolina (C)	22	29	0
Chattanooga, Tennessee (A)	33	46	0
Cheyenne, Wyoming (A)	408	422	446
Chicago, Illinois (C)	251	(a)	254
Cincinnati, Ohio (C)	86	66	0
Cleveland, Ohio (A)	222	168	220
Columbia, Missouri (A)	110	76	22
Columbia, South Carolina (C)	11	10	0
Columbus, Ohio (C)	130	119	87
Concord, New Hampshire (A)	364	294	298
Concordia, Kansas (C)	99	83	65
Dallas, Texas (A)	14	5	0
Davenport, Iowa (C)	167	115	118
Dayton, Ohio (A)	163	127	81
Deer Lodge, Montana (C)	(a)	467	487
Denver, Colorado (C)	253	248	267
Des Moines, Iowa (A)	188	115	118
Detroit, Michigan (A)	235	192	226
Devils Lake, North Dakota (C)	337	255	424
Dodge City, Kansas (A)	102	105	47
Dubuque, Iowa (C)	249	173	149
Duluth, Minnesota (C)	421	411	521
Eastport, Maine (A)	512	472	543
Elkins, West Virginia (A)	224	199	177
El Paso, Texas (A)	14	27	0
Ely, Nevada (A)	394	449	(a)
Erie, Pennsylvania (C)	308	224	257
Escanaba, Michigan (C)	391	345	490
Evansville, Indiana (A)	87	74	0
Fargo, North Dakota	301	203	327
Fort Smith, Arkansas (A)	29	21	0
Fort Wayne, Indiana (A)	233	174	130
Fort Worth, Texas (A)	10	5	0
Fresno, California (A)	24	56	0
Galveston, Texas (C)	0	0	0
Grand Junction, Colorado (A)	109	151	118
Grand Rapids, Michigan (A)	235	202	174
Green Bay, Wisconsin (C)	335	234	322
Greensboro, North Carolina (A)	41	49	0
Greenville, South Carolina (A)	27	20	0
Harrisburg, Pennsylvania (A)	156	133	90
Hartford, Connecticut (A)	256	179	202
Hatteras, North Carolina (C)	3	17	0
Havre, Montana (C)	236	275	369
Helena, Montana (A)	368	394	402
Houston, Texas (C)	0	0	0
Huron, South Dakota (A)	242	213	267
Indianapolis, Indiana (A)	144	113	59
Jackson, Mississippi (A)	8	3	(a)
Kansas City, Missouri (A)	91	55	6
Knoxville, Tennessee (A)	43	55	0
La Crosse, Wisconsin (A)	253	113	183
Lander, Wyoming (A)	360	393	428

(a) Data not available.

City	May		
	1952	1951	Normal
Lansing, Michigan (A)	274	209	229
Lewiston, Maine (O)	324	288	344
Lincoln, Nebraska (C)	126	95	99
Little Rock, Arkansas (A)	25	18	0
Livingston, Montana (C)	(a)	367	405
Los Angeles, California (C)	10	69	90
Louisville, Kentucky (A)	74	68	0
Lynchburg, Virginia (A)	65	82	0
Macon, Georgia (A)	11	5	0
Madison, Wisconsin (C)	235	170	236
Marquette, Michigan (C)	469	365	496
Memphis, Tennessee (A)	20	33	0
Meridian, Mississippi (A)	(a)	11	0
Milwaukee, Wisconsin (A)	333	240	350
Minneapolis, Minnesota (A)	224	132	236
Moline, Illinois (A)	195	132	(a)
Montgomery, Alabama (A)	11	4	0
Nantucket, Massachusetts (A)	335	331	384
Nashville, Tennessee (A)	47	60	0
New Haven, Connecticut (A)	256	202	223
New Orleans, Louisiana (C)	0	0	0
New York, New York (C)	176	121	171
Nome, Alaska† (A)	(a)	765	973
Norfolk, Virginia (C)	22	45	0
North Head, Washington (C)	417	391	422
North Platte, Nebraska (A)	224	207	199
Oakland, California (C)	165	162	205
Oklahoma City, Oklahoma (C)	40	27	0
Omaha, Nebraska (A)	138	94	84
Oswego, New York (C)	401	302	357
Parkersburg, West Virginia (C)	101	84	53
Peoria, Illinois (A)	184	123	121
Philadelphia, Pennsylvania (C)	110	85	115
Phoenix, Arizona (C)	0	15	0
Pittsburgh, Pennsylvania (C)	158	113	78
Pocatello, Idaho (A)	255	279	332
Portland, Maine (A)	406	347	366
Portland, Oregon (C)	198	207	245
Providence, Rhode Island (C)	220	189	251
Pueblo, Colorado (A)	173	175	186
Raleigh, North Carolina (C)	29	29	0
Rapid City, South Dakota (A)	278	276	344
Reading, Pennsylvania (C)	130	99	96
Red Bluff, California (A)	46	79	(a)
Reno, Nevada (A)	290	348	366
Richmond, Virginia (C)	51	59	0
Rochester, New York (A)	325	237	260
Roswell, New Mexico (A)	54	42	0
Sacramento, California (C)	78	80	53
St. Joseph, Missouri (A)	118	75	16
St. Louis, Missouri (C)	85	55	0
Salt Lake City, Utah (A)	151	198	236
San Antonio, Texas (A)	0	2	0
San Diego, California (A)	32	79	115
Sandusky, Ohio (C)	197	168	183
San Francisco, California (C)	239	240	264
Sault Ste. Marie, Michigan (A)	518	363	502
Savannah, Georgia (A)	(a)	0	0
Scranton, Pennsylvania (C)	244	166	171
Seattle, Washington (C)	258	244	316
Sheridan, Wyoming (A)	298	296	403
Shreveport, Louisiana (A)	7	4	0
Sioux City, Iowa (A)	186	135	164
Spokane, Washington (A)	256	321	285
Springfield, Illinois (C)	129	67	56
Springfield, Missouri (A)	96	97	12
Syracuse, New York (A)	327	249	267
Tacoma, Washington (C)	309	291	332
Terre Haute, Indiana (A)	141	112	0
Toledo, Ohio (A)	226	180	180
Topeka, Kansas (C)	96	59	34
Trenton, New Jersey (C)	154	124	81
Utica, New York (O)	365	244	253
Valentine, Nebraska (C)	251	255	274
Walla Walla, Washington (C)	136	152	171
Washington, D. C. (C)	69	68	25
Wichita, Kansas (A)	71	69	0
Williston, North Dakota (C)	294	278	362
Winnemucca, Nevada (C)	318	334	324
Yakima, Washington (A)	197	240	186

(a) Data not available. †Nome data are for April.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Rees, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

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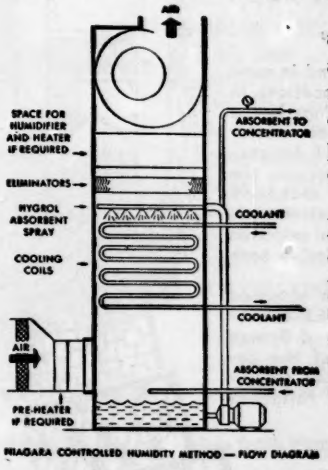

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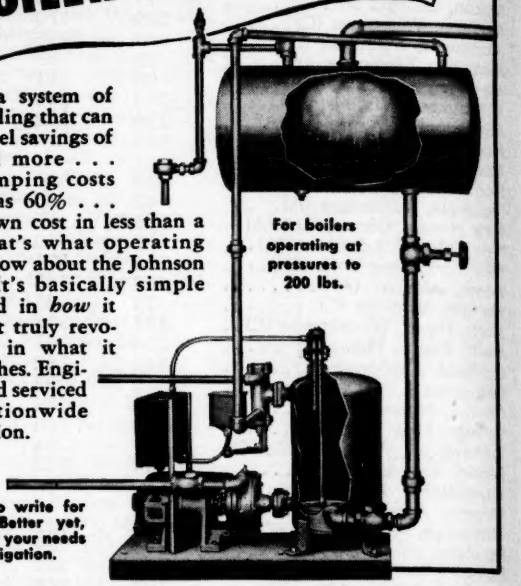

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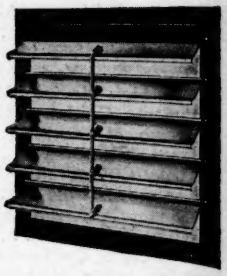

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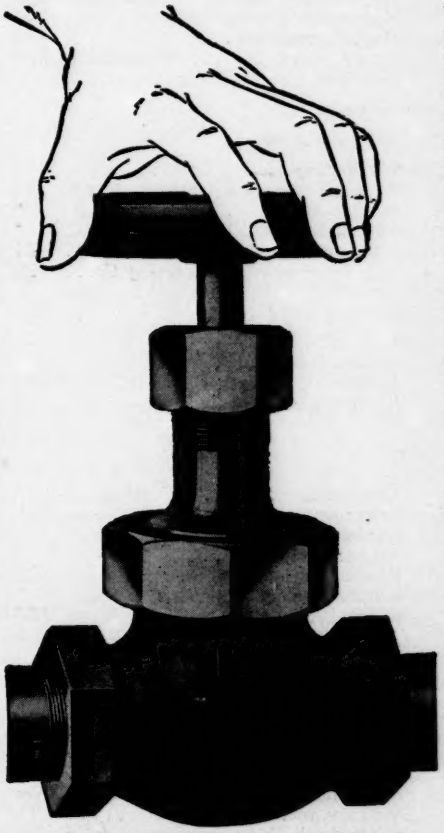

KENNEDY Fig. 89, Bronze Globe Valve
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BALANCING AIR FLOW IN AIR CONDITIONING SYSTEMS

(Concluded from previous data sheet)

As in balancing the apparatus, the testing of the duct outlets should be done in a careful and systematic manner.

Balancing Duct Distribution

The simplest procedure is to take the blue-prints of the duct layout, and number each grille, splitter and damper. On the larger jobs, it is good practice to mark also the grilles, dampers, etc. In marking the prints, where the supply duct is divided into two or more branches, each branch should be numbered or lettered as well as the grilles, etc. For example, supply S-1 will have grille S-1-1, S-1-2, etc., and the return R-1-1, R-1-2, etc.

Tabulation of test results is very important and it will be found that careful recording will save considerable time. A sample tabulation is given in Table 2.

TABLE 2—RESULTS OF TESTS.

Date: .....

Job: .....

Supply duct No.	1	1	1	1	1	1
Grille No.	1	2	3	4	5	6
Estimated cfm	350	350	350	350	350	350
Grille area, sq ft....	.78	.78	.78	.78	.78	.78
Est. velocity, fpm...	450	450	450	450	450	450
Readings (1)	475	425	500	410	470	440
Readings (2)	460	440	440	470	455	465
Readings (3)	460	455	452	448	450	455
Readings (4)	...	...	...	...	...	...
Readings (5)	...	...	...	...	...	...
Final cfm	358	354	352	348	350	352
Damper	1	1	1	1	1	...
Setting (1)	2	3	2½	3	3	...
Setting (2)	...	...	...	...	...	...
Setting (3)	...	...	...	...	...	...
Setting (4)	...	...	...	...	...	...

Balancing Duct Systems

(1) When the cfm from the fan is correct, for all damper positions, determine the amount of air to be handled by each branch.

(2) Measure each branch at a suitable point, and from the estimated cfm figure the velocity of air in the duct.

(3) Convert velocity into pressure in inches of water.

(4) Take velocity readings in the branch ducts and set the splitter so that the velocity pressure will be as figured under (3). Note: It is not necessary to take a complete transverse of the duct, but for this purpose three or four readings is all that is required in large ducts.

(5) When the cfm to all the branch supplies are approximately correct, select one branch and take reading of all grilles, record and compare these with the estimated velocities.

(6) From the tabulations of the grille test, note which ones have higher velocity than estimated, and set the dampers or valves to reduce the air quantity to these grilles. This will automatically increase the cfm of the grilles which have low velocity.

(7) Repeat the readings as under (5) and (6) until all are within 10% of estimate.

(8) Proceed in a similar manner on the remaining branches.

(9) Make up a tabulation of the return grilles similar to the tabulation for the supply grilles.

(10) By means of an anemometer, determine the cfm on the return grilles and set the dampers so each handles the correct amount.

(11) Take wet and dry bulb readings in various areas to determine the uniformity of temperature and humidity and adjust the supply grilles if necessary.

Balancing Systems Using Booster Fans

On installations using booster fans, the by-pass air is handled at each zone fan, and there is no by-pass at the main apparatus. The balancing of such a system is done substantially in the following manner:

Setting of Outside and Return Air Dampers—The following three steps should now be followed:

(1) Close the by-pass and open the dehumidified air dampers on all the booster fans.

(2) Proceed as (1) to (6) under Balancing Medium or Large Air Conditioning Systems.
Note: Under "Starting the Fan," the booster fans should also be started.

(3) Close the maximum outside air damper and open the return damper on the main supply apparatus.

Setting Total Air Quantities—This is a more extensive procedure and calls for the following steps:

(4) Close the dehumidified air and open the by-pass dampers on the booster fans.

(5) By means of pitot tube readings on the booster fan discharges, determine the actual cfm being handled by each fan. If this cfm differs from the design value, change the fan speed in the proportion of the cfm required over the cfm observed.

(6) When the cfm of each booster fan is correct, take the static pressure in the booster fan discharge.

(7) Open the dehumidified air and close the by-pass dampers on the booster fans.

(8) Set the splitters in the supply duct from the main fan so that each booster fan receives the correct proportion of the total cfm regardless of whether the total is correct or not. To do this, take the pitot tube readings and determine the total cfm from the main fan, and then take readings at each branch duct to the booster fans and set the splitters accordingly.

(9) Take a static pressure reading in the booster fan discharge. If this reading is 10% above or below the static pressure taken at (6), change the speed of the main supply fan by:

$$\text{New rpm} = \text{old rpm} \sqrt{\frac{\text{S.P. taken under (6)}}{\text{S.P. taken under (9)}}}$$

This procedure will be satisfactory when the cfm of the booster fan is equal to the cfm of dehumidified air from the main supply fan. When the booster fan cfm is greater than the cfm of dehumidified air supplied to it, such as when a constant amount of by-pass air is handled, proceed as under (1) to (8).

(10) With the by-pass dampers open and the dehumidified air dampers closed, take a static pressure reading in the by-pass air duct near the damper.

(11) Open the dehumidified air and close the by-pass dampers on all booster fans. If a hand by-pass damper is provided, open it slightly to an approximate position to handle the cfm of the constant by-pass; if not, block the automatic dampers partially open.

(12) By means of an anemometer, Velometer or pitot tube, determine the cfm of the constant by-pass air and place a stop on the dampers when the correct position is found.

(13) Open the dehumidified air dampers and close the by-pass dampers to the stop.

(14) Take a static pressure reading in the dehumidified air supply duct, as near as possible to the damper. If this static pressure is more than 10% above or below the static pressure taken at (10), change the main supply fan speed accordingly. Note: While the static pressure taken under item (10) may not be the same on each fan, the difference between the static pressure taken at (10) and (14) should be the same for each fan.

(15) With the static pressure taken under (10) and (14) equal, the total cfm from the main supply fan should be correct. However, take pitot tube readings in the main dehumidified air supply duct to check. If it is not correct, the indication is that either the by-pass air dampers were not set correctly or the booster fans were not receiving the correct proportion of air as set under item (8).

(16) Take a static pressure reading in the discharge of the main supply fan and set the static regulator to maintain a constant static pressure (if a static pressure regulator is furnished).

(17) Open the by-pass damper and close the dehumidified air damper to the approximate minimum position.

(18) With a pitot tube, check the dehumidified air supply to each booster fan and set the dampers to the correct minimum position, and install stops.

Reasons for Checking

There are two important reasons for checking the performance of air conditioning installations as soon as they are placed in operation. They are:

(1) To see that each part is operating correctly.

(2) To see that the various parts and their functions are coordinated.

This coordination is generally termed "balancing" and is necessary on the small job as well as the larger one. A time-saving step in balancing is to tabulate the air quantities for the system. While the following list will cover any installation, some of these items may be omitted for the small jobs.

Maximum outside air and percentage of total fan cfm.
Minimum outside air and percentage of total fan cfm.
Maximum return air and percentage of total fan cfm.
Minimum return air and percentage of total fan cfm.
Maximum cfm through washer and percentage of total fan cfm.
Minimum cfm through washer and percentage of total fan cfm.
Total cfm main fan.
Minimum cfm main fan (on volume control jobs).
Total cfm each booster fan.
Maximum cfm cooled air to booster fan.
Minimum cfm cooled air to booster fan.
Maximum cfm by-passed air to booster fan.
Minimum cfm by-passed air to booster fan.
Maximum by-pass at washer and percentage of fan capacity.
Minimum by-pass at washer and percentage of fan capacity.
Guarantees for both the percentage humidity and temperature.
Estimated dewpoint of air out of washer.
Jobs are divided into these classifications: Small air conditioning systems; medium or large air conditioning systems; systems using booster fans; volume control jobs.

These classifications cover practically all the installations the average service engineer will be called upon to balance.

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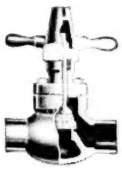

IN AMMONIA VALVES, compact and strong, self-aligning stem disc

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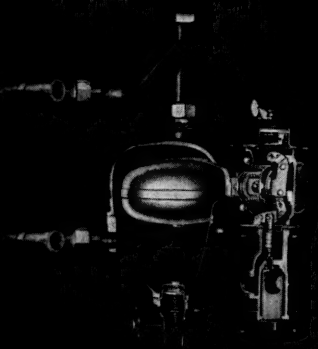
"We feel a boiler undressed if it doesn't have one of your controls"

No. 47-2



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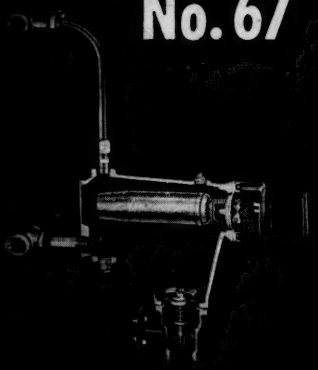

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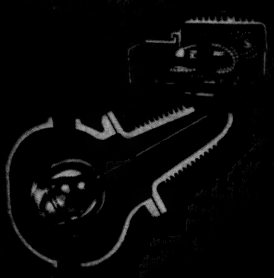

That's the naked truth! It's an alert observation, too; so you won't be surprised to hear that it came from Mr. Alvin Berman of the Alert Plumbing & Heating Co., Chicago. In full, Mr. Berman wrote:

"We use McDonnell controls exclusively and feel a boiler undressed if it doesn't have one of your controls on it."

That word, "undressed," does it. A fellow who knows his stuff can take a quick look at a boiler, and if one essential is lacking the boiler looks stark naked to him.

We're gratified to find that most contractors feel that way about it today. When we started in this business, a boiler feeder or low water cut-off was looked upon almost as a curiosity. After a while its importance was recognized by the boiler insurance people and the code authorities, and today nearly all heating men consider a water level control just as much a part of a boiler's togs as its safety valve or water glass.

As a result, most of the new boilers going in today are safeguarded with boiler feeders, or low-water cut-offs, or feeder-cut-off combinations. That's much appreciated, but have you ever stopped to notice how many of the old boilers in service are still undressed or half-dressed?

Those boilers offer a big field for the man who knows what the well-dressed boiler wears. Some of the McDonnell equipment they need is briefly described here. The new complete catalog contains the answer to practically every boiler safety requirement . . . opens the gateway to extra profits for you.

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Boiler Water Level Controls

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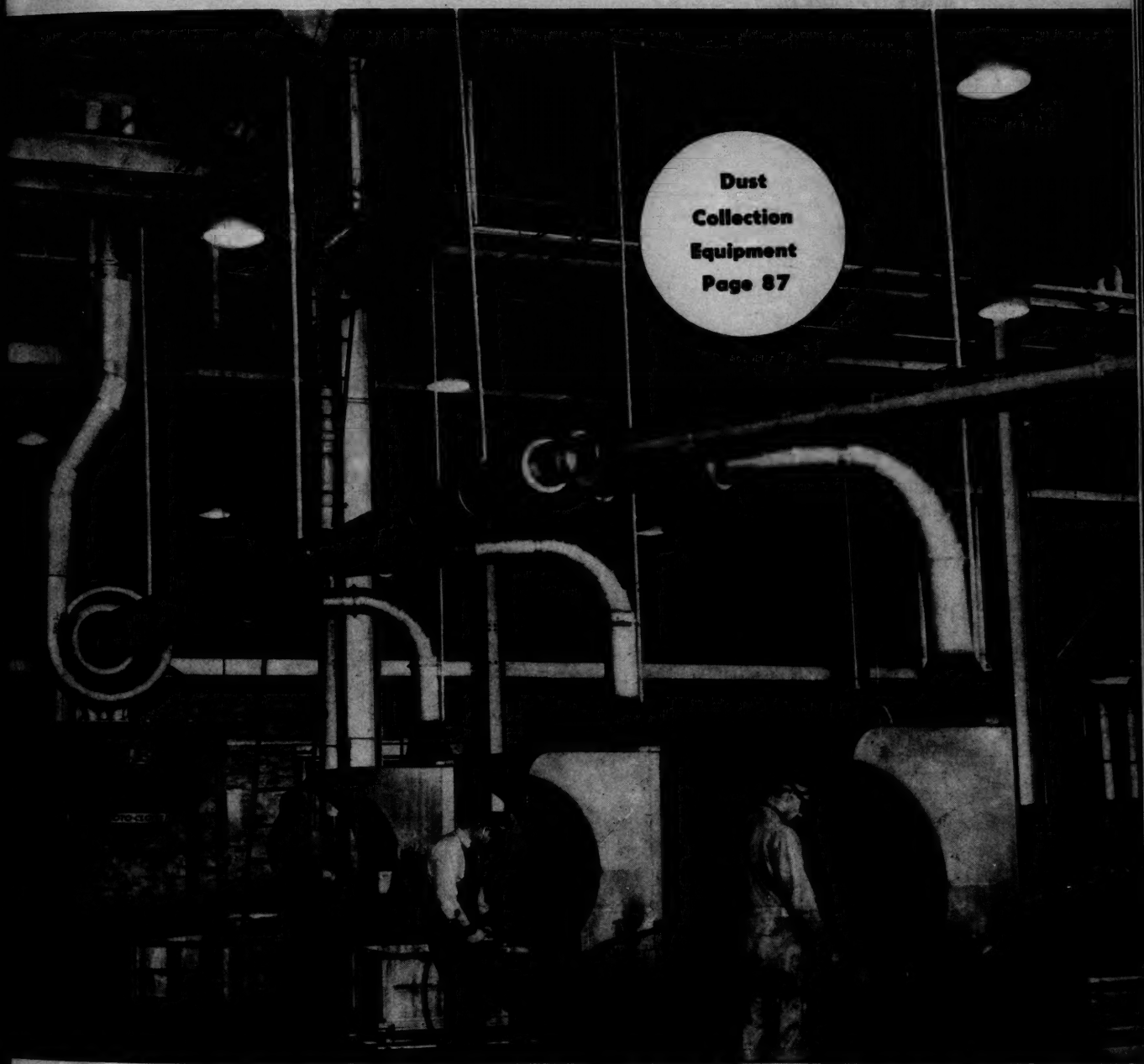

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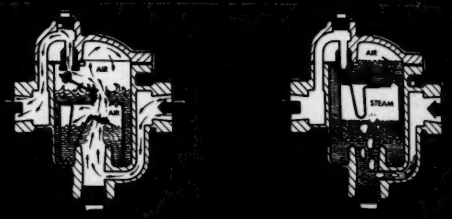

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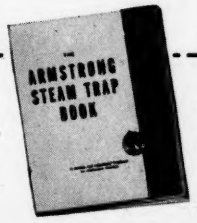

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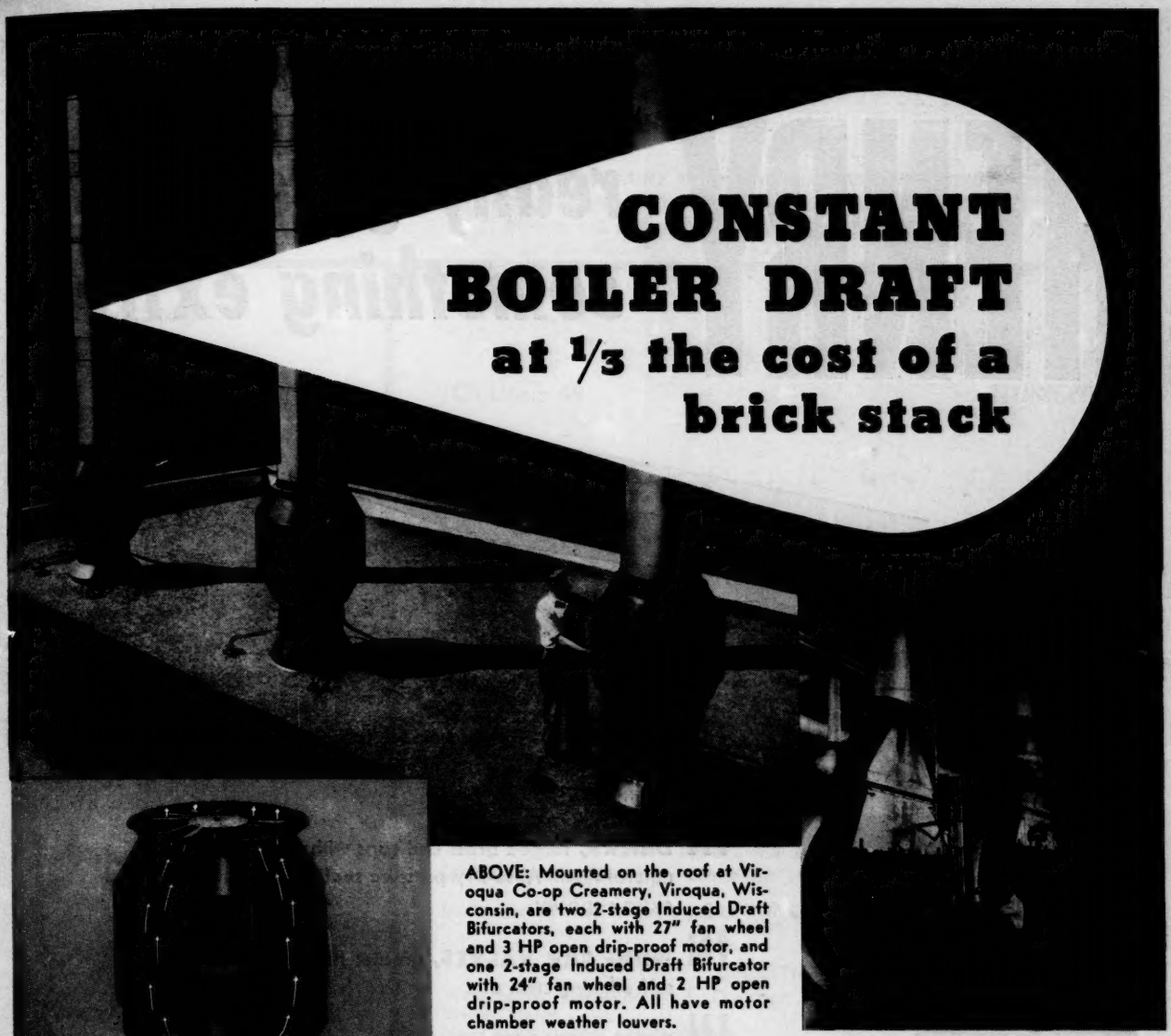

ABOVE: Mounted on the roof at Viroqua Co-op Creamery, Viroqua, Wisconsin, are two 2-stage Induced Draft Bifurcators, each with 27" fan wheel and 3 HP open drip-proof motor, and one 2-stage Induced Draft Bifurcator with 24" fan wheel and 2 HP open drip-proof motor. All have motor chamber weather louvers.

If you have a difficult stack problem, read what Sylvan Dregne, manager of the Viroqua Co-op Creamery, says:

"We have two 200 and one 125 HP oil-fired boilers. During our busy season, we use two boilers for about 15 hours a day, 7 days a week and the one boiler for about 5 hours more after the peak load is over. We installed the Bifurcator Fans in September, 1951, and we have used them since then without any service required. They have proved to be very satisfactory, and they maintain a constant draft regardless of weather conditions. We installed these fans for approximately 1/3 the cost of a suitable brick stack."

How much can YOU save by installing Induced Draft Bifurcator Fans? Ask your DeBothezat representative or write our factory for details. Dept. HV-852.

DeBothezat Fans

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